

BLM LIBRARY



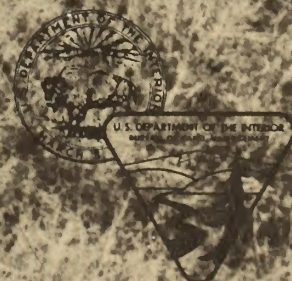
88047984

FORT UNION COAL

GARRISON TRACT

DECEMBER 1981

TD
195
.C58
G366
1981



ID88047984

TD
195
.C58
G366
1981

FORT UNION COAL REGION

GARRISON TRACT ANALYSIS

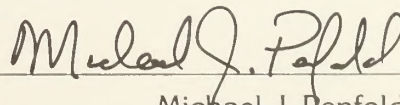
SITE SPECIFIC ANALYSIS

PRELIMINARY FACILITY EVALUATION REPORT

MCLEAN COUNTY, NORTH DAKOTA

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
PO. BOX 25047
DENVER, CO 80225

September 1981



Michael J. Penfold
State Director

PREFACE

This document contains a site-specific analysis and a preliminary facility evaluation report. The site-specific analysis discusses the consequences of leasing and mining a particular tract. The preliminary facility evaluation report discusses significant issues associated with an end use coal conversion facility.

There were 24 tracts identified through a screening process under the over-all direction of the Fort Union Region Coal Team. The team consists of federal, state, and local officials. The tracts are being evaluated for potential federal coal leasing for a coal lease sale scheduled for June 1983. The evaluation, called a site-specific analysis, has been completed for each of the 24 tracts.

Historically, development of a new coal mine in the Fort Union Coal Region has been associated with a coal conversion facility power plant in the vicinity of the mine. For this reason, the Regional Coal Team directed BLM to evaluate impacts of a typical facility near each potential mine. A preliminary facility evaluation report was prepared for each facility.

The Fort Union Regional Coal Team will begin ranking and grouping selected tracts into alternative leasing patterns for the 1983 lease sale using information from these individual reports. These groupings of tracts will form the basis for alternatives and a regional environmental impact statement to be developed during 1982. The analysis in this report represents an important step in a lengthy process which takes place prior to any final decision on federal coal leasing within the region.

Of the 24 tracts currently being evaluated, 16 would require the opening of new mines. One of the 16 would be specifically earmarked for small business. The remaining eight tracts constitute coal which would be needed to maintain production or prevent the by-pass of federal coal at an ongoing mining operation.

Approximately 1.6 billion tons of recoverable federal coal lie within the areas being evaluated. Final designation of some areas as unsuitable for mining under the 1977 Surface Mining Control and Reclamation Act will likely reduce the amount of federal coal actually available for leasing and development, and could remove several of the 24 tracts from further consideration. This information will not be available until early 1982.

A major purpose of the site-specific analysis and preliminary facility evaluation reports is to acquaint the public with key issues and consequences of leasing and development of federal coal reserves so that they may (1) offer comments to the Fort Union Regional Coal Team on what areas they consider most important to be evaluated and analyzed in the ranking of the tracts and in the Regional EIS and (2) offer specific advice on what decision alternatives the Coal Team should look at more closely.

CONTENTS

Site Specific Analysis

Introduction	1
Chapter I — Alternatives	5
Chapter II — Affected Environment	7
Chapter III — Environmental Consequences	23
References	39
Summary Matrix	41
Unsuitability Criteria Results	49

Preliminary Facility Evaluation Report

Goals and Objectives	53
Part One — Assumptions and Variables	53
Part Two — Relationship of Tract and Facility	59

SITE SPECIFIC ANALYSIS

INTRODUCTION

The purpose of this action is to offer 44.9 million tons of federal strippable coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the nation.

This site specific environmental analysis has been prepared for the Garrison tract (Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of federal coal within the tract for a June 30, 1983 coal lease sale schedule. If selected and leased, the Garrison tract would contribute 44.9 million tons of federal coal to the regional leasing target. Presently, a regional leasing target has not been established by the Secretary of the Interior. The preliminary regional leasing target will be established in August 1981 and finalized in October 1981.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office adopted the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of areas of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration for new competitive leasing, lease exchanges, and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

BLM Dickinson District Staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things, some of the unsuitability criteria were further considered. Any new findings are reflected in this report.

Information from this and other site-specific analyses will be used by the Regional Coal Team during the tract ranking and selection process for a lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Among the alternatives addressed will be different combinations of tracts that meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the Regional Coal Team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

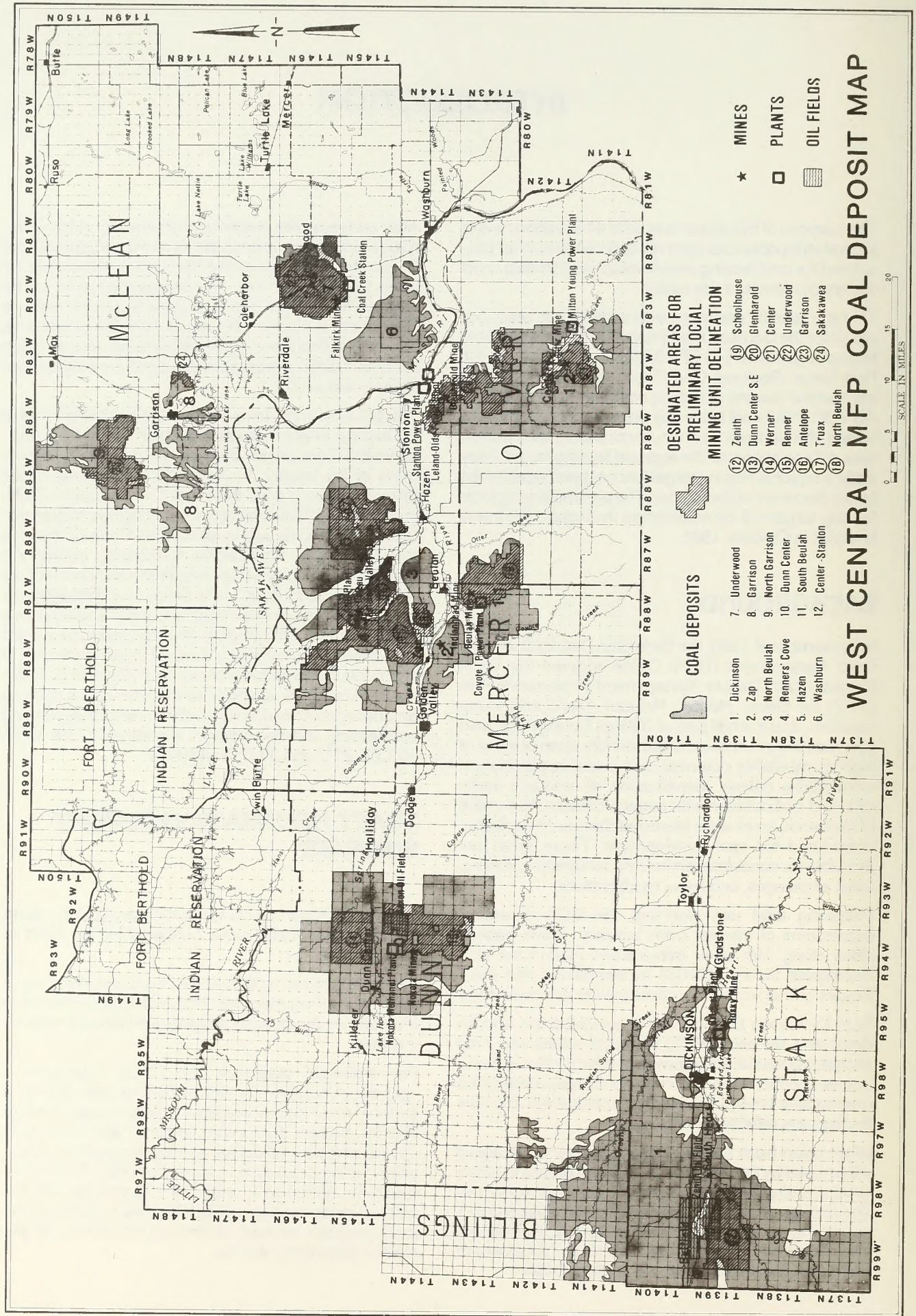
Tracts in the Fort Union Region are being considered for leasing in accordance with the Federal Coal Management Program adopted by the Secretary, Department of the Interior, in June 1979. The basis of the program was, in part, the Final Environmental Statement, Federal Coal Management Program. Implementation procedures are contained in Code of Federal Regulations, (43 CFR 3400). Authorizing actions are the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and Federal Regulations concerning federal coal leasing and development including 43 CFR 3400; 30 CFR 211; and 30 CFR 700-899.

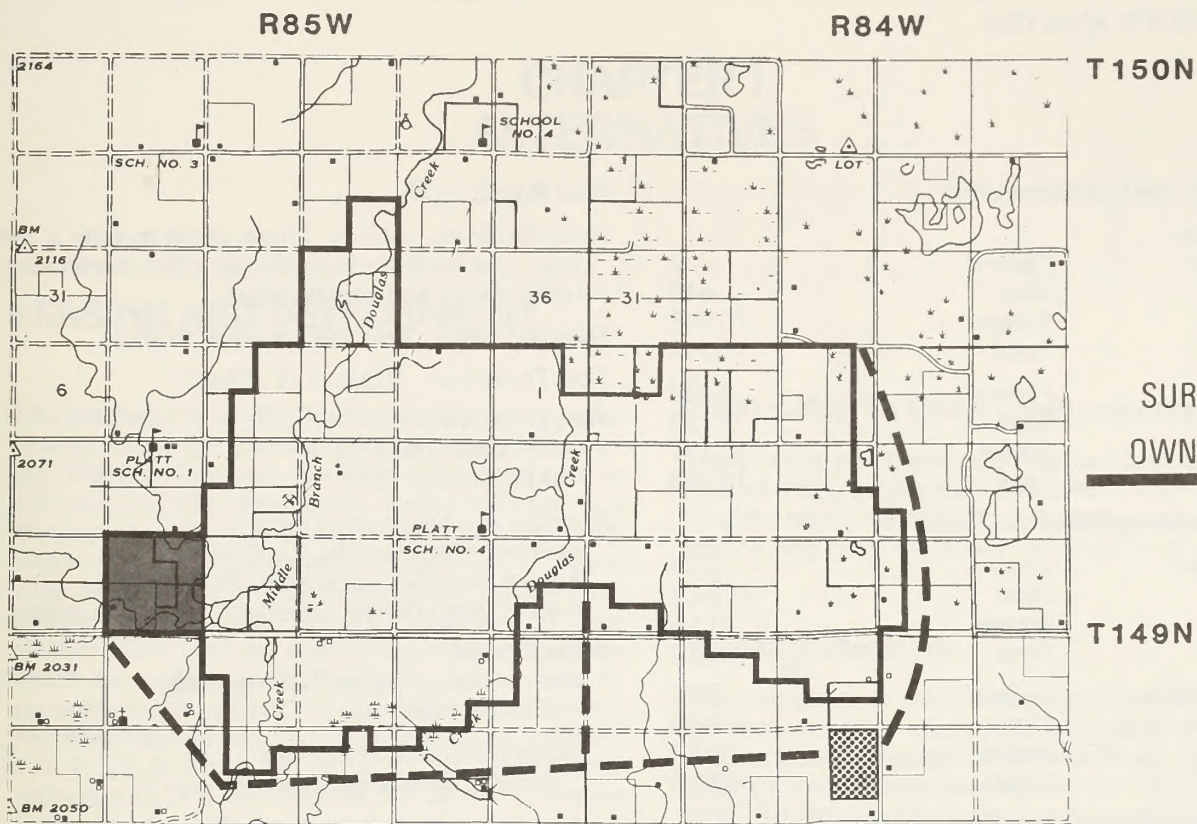
TRACT DELINEATION REPORT SUMMARY

The Garrison tract is located in McLean County, North Dakota, about three miles northwest of the town of Garrison (Map 1).

The tract is based on the Minter bed found at the top of the Tongue River Member of the Fort Union Formation (Paleocene). No geologic hazards are known to exist on this tract.

For analytical purposes, the USGS developed a "generic mine plan" for this tract. This plan calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers, rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be a off-site electric generating station.

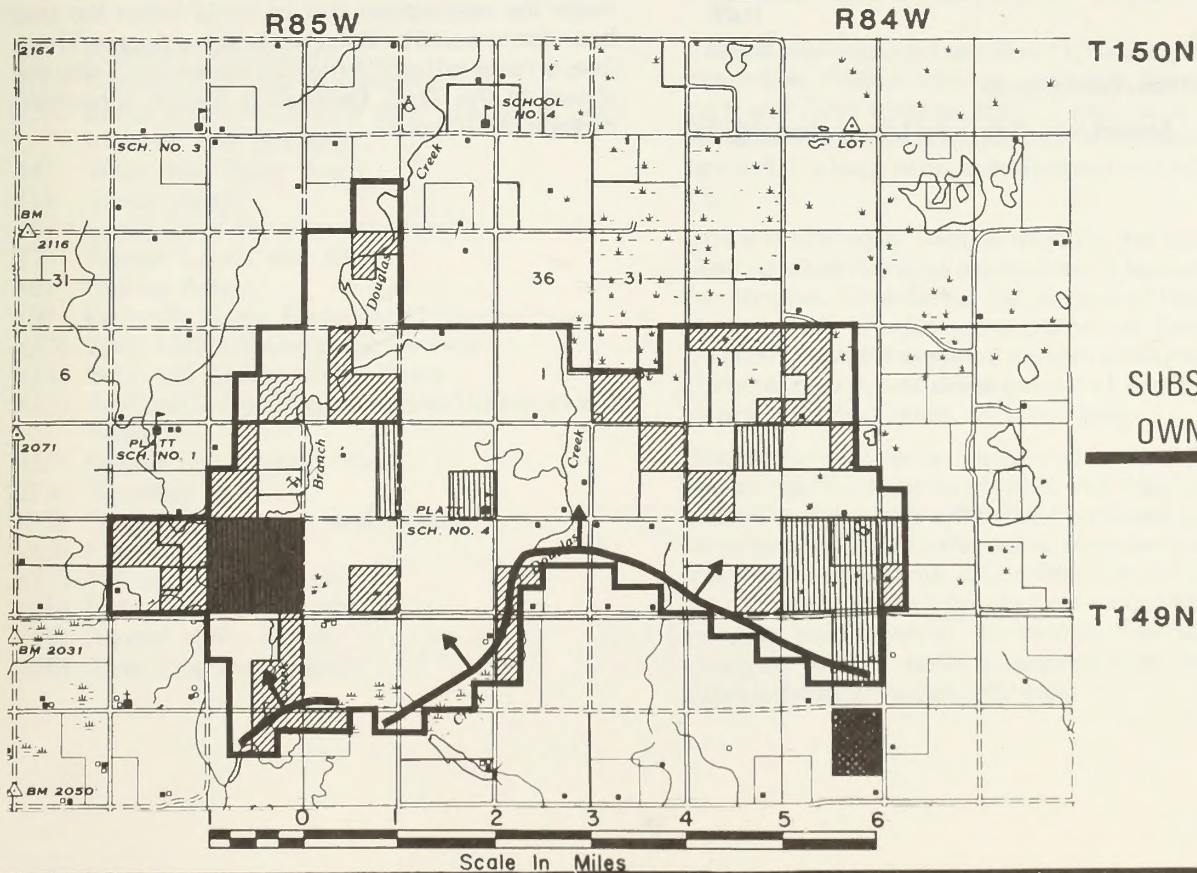




GARRISON TRACT

LEGEND

- | | | | |
|-------------------------------|--------------------|-----------------|-----------------------|
| — Tract Boundary | State Coal | State Surface | Out-of-Pit Haul Roads |
| Federal Coal (100%) | Private Coal | Private Surface | Pit Advancement |
| Federal Coal (Less than 100%) | Surface Facilities | | |



SITE SPECIFIC ANALYSIS

Specific Tract Characteristics:

Acreage:		
Surface:	Federal	0
	State	640
	Private	16,068
	Total:	16,708
Coal:	Federal	3,437
	State	2,120
	Private	11,151
	Total	16,708

Coal Reserves/Millions of Tons:

In Place:	Federal	49.9
	State	24.7
	Private	213.6
	Total	288.2
Recoverable:	Federal	44.9
	State	22.2
	Private	192.2
	Total:	259.3

Bypassed Federal Coal:

Total Acres	383
In Place Reserves	6.4 million tons
Recoverable Reserves	5.8 million tons

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	37.4%
Volatile matter	26.3%
Fixed carbon	26.8%
Ash	9.4%
Sulfur	0.4%
BTU's/lb	6,425

Surface Disturbance/acres

Mining: Annual rate, 406; Total Life of Mine, 16,250

Haul Roads: 173

Mine Facilities: 240 — These could include a rail loop, coal loadout, changehouse, office, warehouse, repair shops, and parking areas.

Stripping Ratio: Less than or equal to 20:1

Coal Thickness: 5 feet to 17.5 feet.

Mine Employment:

Peak Construction - 200

Full Production - 225

Royalties and Severance Taxes:

Annual Federal Royalty, \$0.84 million

Annual North Dakota Royalty, \$0.42 million

Annual North Dakota Severance Tax, \$5.85 million

Water Needs:

Human Consumption, 7,000 gal./day

Source: Well water

Nonpotable, 60,000 gal./day

Source: Lake Sakakawea

For more specific information on the proposed mining operation, refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the resource specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I

ALTERNATIVES

LEASING AND DEVELOPMENT

The alternative is to offer for further consideration the federal coal in the Garrison tract for competitive leasing. This tract has been identified as a logical mining unit for a 6.5 million ton per year surface mine having a 40 year mine life. The Garrison tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota Management Framework Plan (MFP) adopted in September 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20 as defined in 43 CFR 3461. Criteria 7, 9, 14, and 15 require further study. With the exception of criterion 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact study, if not, this tract will be dropped from further consideration. Criteria 3 will be deferred until mining and reclamation plans are submitted to OSM and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

- (1) Federal Land System
- (2) Rights-of-Way and Easements
- (3) Buffer Zones along R/W and Adjacent to Communities and Buildings
- (4) Wilderness Study Areas
- (5) Scenic Areas
- (6) Lands Used for Scientific Studies
- (7) Historic Lands and Sites
- (8) Natural Areas
- (9) Federally Listed Endangered Species
- (10) State Listed Endangered Species
- (11) Bald and Golden Eagle Nests
- (12) Bald and Golden Eagle Roost and Concentration Areas
- (13) Falcon Cliff Nesting Sites
- (14) Migratory Birds
- (15) State Resident Fish and Wildlife
- (16) Floodplains
- (17) Municipal Watersheds
- (18) National Resource Waters
- (19) Alluvial Valley Floors
- (20) State Proposed Criteria

Relationship To Other Developments

There is one inactive mine in the tract boundary. The nearest active mine is the Falkirk Mine which is about 22 miles southeast of the tract. Farming and ranching are the only other significant activities in or near the tract.

Mitigation Measures

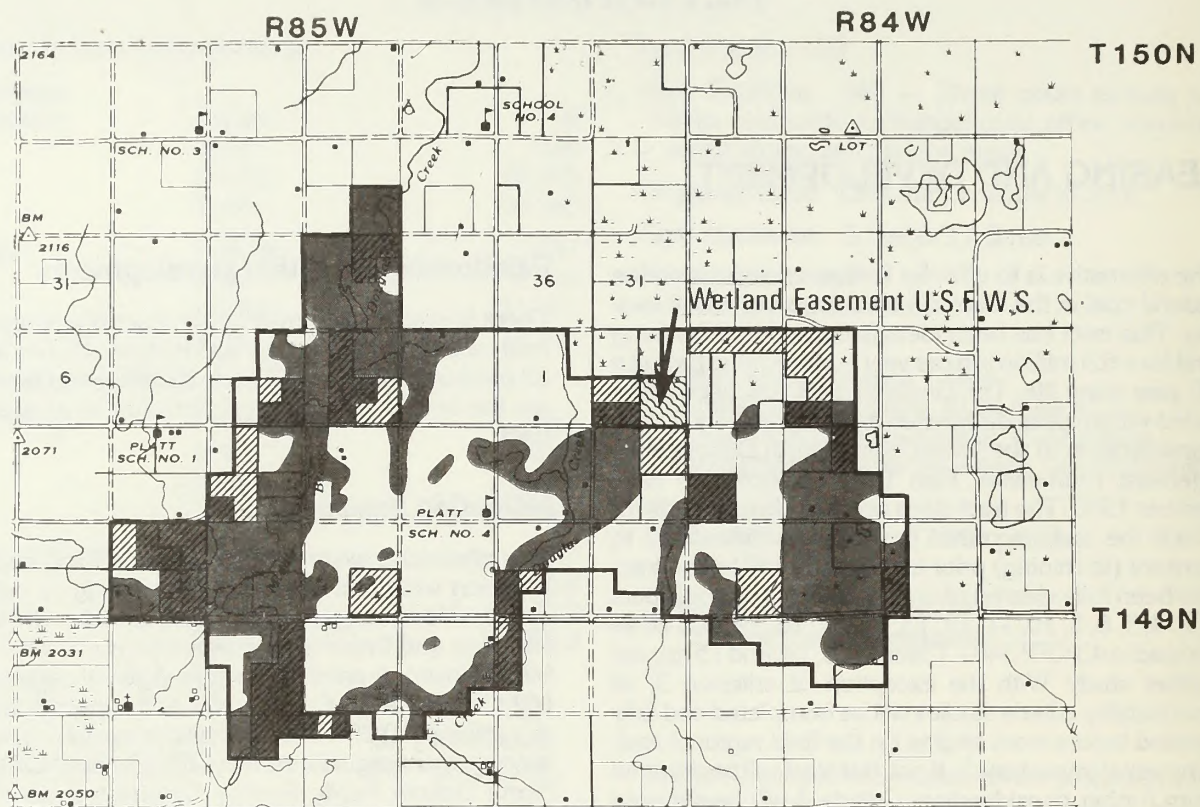
This alternative assumes that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: OSM Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), Department of Interior's coal management regulations (43 CFR 23 and 3400), and North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for leasing under this alternative. Federal reserves represent about 17 percent and State reserves about 9 percent of the coal available in the tract. If federal coal is not leased, development of a large economical mining unit is not feasible.

There is one small inactive mine on the tract. There were no small business expressions of leasing interest for the area. Considering the amount of federal coal involved, the checkerboard pattern of federal coal ownership and the apparent trend in small mine development, near future development of any small coal mines in the tract boundary is not likely.

Should the tract not be considered for further leasing, there would be about 3 percent or 44.9 million tons less federal coal available within the Fort Union Region for consideration in tract selection to meet the federal leasing target. Also, about 22.2 million tons of state and 192.2 million tons of private coal would be lost for possible production in the region. Few significant changes to the existing environment would be expected during the next 40 years.



LEGEND



Federal Coal

Areas being considered as unsuitable by BLM and others
based on existing information.

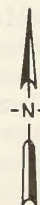
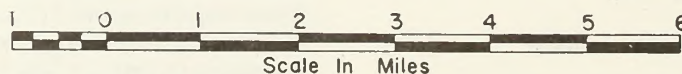


Wildlife Habitat



Potential Dwellings

Note: Detailed maps are available for inspection at the Dickinson BLM District Office.
(Rights-of-way too numerous to show.)



GARRISON TRACT

CHAPTER II

AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and this trend is expected to continue. The physical resources described in this section represent only existing conditions, while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

Most of this tract is located in the Coteau Slope physiographic area which consists of stream-dissected bedrock with a veneer of glacial deposits. The northeastern part of the tract is located in the Coteau du Missouri physiographic area which consists of knob-and-kettle topography.

GEOLOGY AND MINERALS

The exposed bedrock in this tract consists of the Tongue River and Sentinel Butte Member of the Fort Union Formation (Paleocene). The Tongue River Member consists of nonmarine light buff-yellow siltstone, sandstone, claystone, and lignite. The Minter coal bed occurs at the top of the Tongue River. The Sentinel Butte Member conformably overlies the Tongue River and consists of gray, interbedded sandstone, siltstone, and claystone with lignite beds.

The Minter bed is the principal lignite resource in the tract. Total thickness varies from 5 to 17.5 feet. The bed has a major parting of up to 24 feet in the center of the tract with a lower bench of 5 feet. Overburden varies from 0 to 130 feet. The tract contains 16,250 acres underlain by 288.2 million tons of reserve-base lignite (49.9 million tons federal, 213.6 million tons private, 24.7 million tons state).

No oil and gas is being produced on this tract at this time but there is at least some chance due to the tracts location in the Williston Basin.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

Most all of the soils in the Garrison tract have formed in glacial till, outwash, and alluvium. The Williams-Bowbells mapping units dominate the landscape. They are gently sloping deep, well drained, loamy soils of medium to high natural fertility. The only major change in soils is along the western edge of the tract where the Middle Branch of Douglas Creek runs north-south through the tract. Zahl-Max soils on rolling to steep uplands are common on both sides of the creek. The bottomland is primarily composed of the Harriet-Saline land complex. This drainageway is the only major part of the tract with high erosion potential.

Soil quality is reflected in the reclamation suitability ratings and acreage figures for the SCS Order II county soil survey mapping units in the tract (Table 1). Of the 16,760 total acres involved, 13,200 acres (79%) is in "good" suitability category, 2,399 acres (14%) "fair," and 1,161 acres (7%) "poor." Williams-Bowbells mapping units comprise most of the "good." The Zahl-Max units make up most of the "fair." Most of the "poor" is composed of the Harriet-Saline land complex.

The suitability data in Table 2 is developed by surface landowners because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owners land must be reclaimed with soil originally removed from their respective holdings. The table therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability as plant growth material on surface-mined land.

HYDROLOGY

This tract is located in a glaciated area with dead-ice moraine covering the eastern part and sheet moraine over the rest. Two surface drainageways cut valleys through the till, the east and middle branches of Douglas Creek. Both of these creeks flow about seven miles south where they empty into Lake Sakakawea. The dead-ice moraine area is covered with potholes and very little surface runoff from this area is contributed to Douglas Creek. The sheet moraine area has a more definite drainage pattern but surface flow is sluggish under low gradients.

TABLE 1
GARRISON TRACT - SOILS

PAGE 1 OF 4

Map Symbol and Soil Mapping Unit Name	Percent Slope	Soil Erosion Potential	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation	Soil Hazard Conditions
	Usually Underwater	Wind	Water	
Af - Aquolls		Low	Low	Too clayey
ArA - Arnegard loam	1-3	Low	Low	Good
ArC - Arnegard loam	6-9	Low	Mod	Good
BoA - Bowbells loam	1-3	Low	Low	Good
BwA - Bowdle loam	1-3	Low	Low	Good
ByB - Bowdle-Stady loams	3-6	Low	Mod	Good
Co - Colvin silty clay loam	0-1	Low	Low	Fair
Dv - Divide loam	0-1	Mod	Low	Fair
FbA - Falkirk and Max loams	1-3	Low	Low	Good
FfA - Farnuf loam	1-3	Low	Low	Fair
FnB - Flaxton fine sandy loam	3-6	High	Mod	Good
GaA - Grail silty clay loam	1-3	Low	Low	Fair
GaB - Grail silty clay loam	3-6	Low	Low	Fair

TABLE 1
GARRISON TRACT - SOILS

PAGE 2 of 4

Map Symbol and Soil Mapping Unit Name	Percent Slope	Soil Erosion Potential ^{1/} Wind	Overall Suitability of Soil for Use as Cover-Soil Material ^{2/} in Surface-Mine Reclamation	Soil Hazard Conditions ^{2/}
G.P. - Gravel Pit	---	---	---	---
HaA - Hamerly loam	1-3	Low	Good	---
Hk - Harriet-Saline land complex	0-1	Mod	Poor	Too clayey, excess sodium & salts
Hs - Heil silty clay loam	0-1	Low	Poor	Too clayey, excess sodium
LeB - Lihen loamy fine sand	1-6	High	Fair	Too sandy
Ma - Makoti silty clay loam	0-1	Low	Fair	Too clayey
Mf - Marysland loam	0-1	Low	Fair	Clayey subsoil
MgB - Max loam	3-6	Low	Good	---
MLC - Max-Zahl loams	6-9	Low-Mod	Good	---
MLD - Max-Zahl loams	9-15	Mod	Good	---
MoC - Morton loam	3-9	Mod	Fair	Clayey subsoil
NbA - Niobell-Williams loams	1-3	Low	Good	---
NmB - Noonan-Miranda complex	1-6	Mod	Fair	Clayey subsoil w/some sodium & salts
Or - Orthents (Mine Spoils)	0-100	Highly Variable	Poor	Too clayey, alkaline, sodium & salts

TABLE 1
GARRISON TRACT - SOILS

PAGE 3 of 4

Map Symbol and Soil Mapping Unit Name	Percent Slope ^{1/}	Soil Erosion Potential ^{1/} Wind	Overall Suitability of Soil for Use as Cover-Soil Material ^{2/} in Surface-Mine Reclamation	Soil Hazard Conditions ^{2/}
Pa - Parnell silty clay loam	0-1	Low	Fair	Too clayey
PhB - Parshall fine sandy loam	3-6	High	Good	----
RgC - Regent silty clay loam	3-9	Low	Fair	Too clayey
RhB - Rhoades complex	1-9	Mod	Poor	Too clayey, excess sodium & salts
Ro - Roseglen silt loam	0-1	Low	Good	----
RxB - Ruso-Manning complex	3-6	Mod	Fair	Too sandy
RzA - Ruso soils	1-3	Mod	Fair	Too sandy
Sn - Sinal silty clay	0-1	Low	Poor	Too clayey
Tp - Tonka-Parnell complex	0-1	Low	Fair	Too clayey
WbD - Wabek soil	6-15	Mod	Poor	Excess small stones, too sandy, droughty
WoA - Williams-Bowbells loams	1-3	Low	Good	----
WoB - Williams-Bowbells loams	3-6	Low	Good	----

TABLE 1
GARRISON TRACT - SOILS

PAGE 4 of 4

Map Symbol and Soil Mapping Unit Name	Percent Slope	Soil Erosion Potential Wind	1/ Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation	2/ Soil Hazard Conditions
WpB - Williams-Bowbells-Zahl loams	3-6	Low	Low	Good	----
ZcE - Zahl-Cabba complex	15-35	Mod-High	High	Fair	Some lime, Zahl-clayey subsoil
ZmE - Zahl-Max loams	9-35	Mod-High	High	Fair	Zahl-clayey subsoil, some lime
ZwC - Zahl-Williams loams	3-9	Mod	High	Fair	Zahl-clayey subsoil, some lime

1/ From "Soil Survey of McLean County, North Dakota"

2/ Derived by applying the properties of the soils which are described in the above mentioned soil survey report and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS) and the Office of Surface Mining (OSM).

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY
LANDOWNER IN THE GARRISON TRACT

-----ACRES-----					-----ACRES-----				
LANDOWNER NUMBER	GOOD	FAIR	POOR	TOTAL	LANDOWNER NUMBER	GOOD	FAIR	POOR	TOTAL
1	22	49	9	80	30a	239	76	5	320
2	80	0	0	80	b	147	13	0	160
3	82	45	33	160	31	198	2	0	200
4	236	4	0	240	32	150	10	0	160
5	137	44	59	240	33a	124	35	1	160
6	124	36	0	160	b	76	4	0	80
7a	156	4	0	160	34	307	13	0	320
b	97	31	32	160	35a	226	167	87	480
8*	24	34	62	120	b	313	124	43	480
9	152	8	0	160	c	195	39	6	240
10	8	7	0	15	d	38	2	0	40
11a	317	3	0	320	e	152	8	0	160
b	293	27	0	320	36a	160	0	0	160
12	40	0	0	40	b	148	0	12	160
13	269	2	49	320	37	43	76	41	160
14a	290	3	27	320	38	80	0	0	80
b	135	23	2	160	39	80	0	0	80
15	16	61	3	80	40	143	12	5	160
16a	91	69	0	160	41	301	19	0	320
b	140	20	0	160	42a	130	10	20	160
17	134	19	0	153	b	147	13	0	160
18	7	0	0	7	43	246	26	8	280
19	80	46	74	200	44	31	9	0	40
20a	155	5	0	160	45	72	0	8	80
b	159	1	0	160	46	40	0	0	40
c	279	1	0	280	47	50	1	29	80
d	260	48	12	320	48	102	3	15	120
e	283	37	0	320	49	152	8	0	160
f	150	7	43	200	50a	208	22	10	240
21	34	0	6	40	b	142	13	5	160
22a	116	44	0	160	51	72	8	0	80
b	77	3	0	80	52a*	37	1	42	80
c	136	55	34	225	b	158	2	0	160
23a	150	10	0	160	53a	36	33	11	80
b	124	36	0	160	b	29	11	0	40
c	159	71	10	240	c*	32	2	46	80
d	114	6	0	120	54a	709	5	6	720
e	133	27	0	160	b	77	0	3	80
f	286	34	0	320	55	308	271	61	640
24	392	3	5	400	56	131	29	0	160
25	152	8	0	160	58	21	32	27	80
26	160	0	0	160	59*	38	51	71	160
27	153	7	0	160	60	134	26	0	160
28*	0	20	20	40	61	112	48	0	160
29a	63	75	102	240	63	37	106	17	160
b	78	2	0	80	64	148	12	0	160
c	138	22	0	160					
TOTALS					TOTALS				
% OF TOTAL					% OF TOTAL				
					13,200 2,399 1,161 16,872				
					79% 14% 7% 100%				

TABLE 3
WATER QUALITY OF THE LIGNITE AQUIFERS ON THE GARRISON TRACT

	Na (mg/l)	Ca (mg/l)	Mg (mg/l)	SO ₄ (mg/l)	HCO ₃ (mg/l)	TDS (mg/l)	pH
Mean	400	59	37	528	682	1,510	7.3
Maximum	1,150	181	168	1,401	1,244	5,380	10.7
Minimum	37	5	1	128	106	440	6.4

There is no surface water data for this tract but runoff from the contributing area is about 0.75 inches annually. The surface water is typically a sodium sulfate bicarbonate type.

The only surface water use on this tract is for stock watering and wildlife purposes. Dugouts are located primarily in the eastern portion of the tract. There are about 10 to 15 of these stockponds.

In ascending order above the Pierre Shale, the Fox Hills, Hell Creek, and sand and lignite of the Fort Union formation form aquifers beneath this tract. In the mineable lignite zone aquifers of local importance include the lignite and sand beds. On the west and south edges of the lignite buried valleys are locally important sources of groundwater. The mineable lignite subcrops along these buried valleys.

The flow pattern for groundwater through this system begins with recharge mostly from the higher pothole topography to the northeast. Water then moves down and toward the southwest through the till and consolidated lignite and sand beds. Discharge from the area is to well usage, deep percolation to lower aquifers and drainage into buried valleys along the subcrop.

The quality of the groundwater in this area is typically a sodium sulfate bicarbonate type. Table 3 shows a water quality summary for the lignite aquifer zone.

Groundwater is used in the area for domestic and stockwater supplies. There are about 50 farmsteads in and surrounding this tract. Assuming an average of one and one-half wells per farmstead, there are approximately 75 water wells in the area. The majority of these wells tap either the lignite or a sand zone in close proximity to the lignite.

VEGETATION AND AGRICULTURAL PRODUCTION

The Garrison tract is extensively used for agricultural purposes. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Twenty-five percent or 4,204 acres are fallowed each year (Table 4).

Small grains including durum, spring wheat, oats, sunflowers, winter wheat, flax, barley, rye and corn (in descending order of acreage grown) are grown on 34

percent (5,804 acres) of the tract. Wheat yields average 28.7 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn are also used as feed grains in livestock operations.

Nine percent (1,541 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.95 tons of hay are produced per acre.

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

No threatened or endangered plant species have been identified in the tract.

There are 37 operators and operator partnerships in the tract. Forty-seven percent of the operations have less than 30 percent of their lands within the tract (Table 5). Fourteen percent have 100 percent of their acreage within the tract. Overall, the tract covers 35 percent of the acreage of the operations involved.

Fifty-eight percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Forty-two percent is farmed by owner/operators.

TABLE 4
AGRICULTURAL LAND USE
IN THE GARRISON TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	5,804	28.7 bu.	166,575 bu.
Hayland	1,541	1.95 tons	3,005 tons
Range	4,699	.6 AUM	2,819 AUMs
Other	624	1.95 tons	1,217 tons
Fallow	4,204	n/a	n/a
Total	16,872	n/a	n/a

1/ Crop : wheat equivalent bu./acre
 Hayland : tons/acre of hay
 Range : AUMs/acre
 Other : tons/acre of hay equivalent

TABLE 5

FARM/RANCH OPERATIONS - GARRISON TRACT

PAGE 1 OF 3

INSIDE COAL TRACT (ACRES)										OUTSIDE COAL TRACTS (ACRES)									
OPERATOR	SMALL GRAIN CROP	PERCENTAGE OF TOTAL ACRES					SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES					SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
		HAY	GRAZING							TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING						
1	60	23	14	63	0	160	100	0	0	0	0	0	0	0	0	160	100		
2	24	0	0	16	0	40	0	840	11	106	583	0	1540	1580	3		3		
3	13	0	57	10	0	80	100	576	12	111	421	0	1120	1200	7		7		
4	74	0	9	77	0	160	100	119	91	321	77	0	608	768	21		21		
5	11	0	101	8	0	120	100	575	0	339	435	0	1360	1480	8		8		
6	131	0	19	10	0	160	0	314	0	275	113	0	720	880	18		18		
7	27	0	0	13	0	40	0	279	50	540	131	0	1000	1040	4		4		
8	384	5	375	288	0	1052	100	139	122	172	139	42	640	1692	62		62		
9	224	0	28	244	4	480	100	186	25	1052	186	431	1880	2360	20		20		
10	160	19	87	54	0	320	100	0	0	0	0	0	0	320	100		100		
11	51	0	85	24	0	160	0	462	0	117	281	0	960	1120	14		14		
12	42	0	93	25	0	160	100	276	26	108	160	0	563	723	22		22		
13	84	0	9	67	0	160	100	513	23	218	371	0	1125	1285	12		12		
14	25	44	44	8	0	200	20	435	20	364	209	0	1068	1268	16		16		
15	553	971	160	553	563	2800	27	324	41	35	320	0	760	3560	79		79		

TABLE 5

FARM/RANCH OPERATIONS - GARRISON TRACT

PAGE 2 OF 3

INSIDE COAL TRACT (ACRES)										OUTSIDE COAL TRACTS (ACRES)						PERCENTAGE OF TOTAL ACRES IN TRACT
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL		
16	192	0	215	73	0	480	0	215	49	53	83	0	400	880	55	
17	133	0	96	91	0	320	100	80	0	34	45	0	160	480	67	
18	442	0	44	394	0	880	55	484	40	246	380	0	1120	2000	44	
19	322	91	93	219	0	725	100	669	112	445	544	0	1760	2485	29	
20	83	11	5	61	0	160	0	332	60	320	248	0	960	1120	14	
21	185	0	179	116	0	480	100	261	0	65	154	0	480	960	50	
22	128	0	238	114	0	480	100	146	0	124	130	0	400	880	55	
23	281	50	296	213	0	840	29	413	59	200	328	0	1000	1840	46	
24	344	0	85	211	0	640	50	476	0	248	331	0	1055	1695	38	
25	646	124	594	436	0	1800	58	87	54	30	69	0	240	2040	88	
26	0	9	151	0	0	160	0	381	91	268	60	0	800	960	17	
27	66	0	112	62	0	240	0	2113	192	1194	1970	0	5469	5709	4	
28	28	0	0	12	0	40	0	333	69	140	138	0	680	720	6	
29	57	18	85	3	0	240	50	416	45	251	328	0	1040	1280	19	

TABLE 5

FARM/RANCH OPERATIONS - GARRISON TRACT

INSIDE COAL TRACT (ACRES)										OUTSIDE COAL TRACTS (ACRES)						PAGE 3 OF 3	
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF		SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT	
							TOTAL ACRES LEASED	TOTAL ACRES									
30	278	0	51	243	0	560	100	514	42	157	447	0	1160	1720	33		
31	141	19	91	29	0	280	100	186	19	70	45	0	320	600	47		
32	0	0	160	0	0	160	0	0	0	0	0	0	0	160	100		
33	79	81	213	67	0	440	45	287	12	83	258	0	640	1080	41		
34	264	76	139	264	57	800	0	81	0	301	81	17	480	1280	62		
35	0	0	640	0	0	640	100	0	0	0	0	0	0	640	100		
36	180	0	38	102	0	320	100	0	0	0	0	0	0	320	100		
37	92	0	14	54	0	160	100	86	0	185	49	0	320	480	33		
TOTAL	5804	1541	4699	4204	624	16,877	58	12,598	1274	8173	9114	490	31,649	40,521	35		

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The major land use of the tract area is agricultural as discussed in more detail elsewhere in the report. Other uses include county roads and local utilities, generally located along a road. The nearest population center is Garrison, to the southeast of the tract.

RECREATION

Hunting of a variety of species (deer, upland game birds, waterfowl) is the main recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The community of Garrison, North Dakota offers recreational opportunities in the general vicinity of the tract. Ball diamonds, parks, and a swimming pool along with golf, tennis and gymnasium facilities offer adequate opportunities at this time. Lake Sakakawea, south of the tract, offers state and federal recreational opportunities.

AESTHETICS

The character of the landscape, as noted in other sections of this document is largely agricultural. The natural flat to rolling topography with average slopes of 0 to 15 percent have been superimposed with defined fields. The appearance of the fields varies from year to year and season to season with actively cropped fields, fallow fields, plowed fields and native, grazed prairie. Roads running in a rigid north/south east/west grid often separate the fields. Vertical features in the form of buildings, shelterbelts, wind breaks and wooded areas have an important visual function in breaking up the dominant horizontal aspect of the landscape and for providing orientation.

Man-made features are a part of the character of the landscape. Most of the elements of these activities on the land are expected and appear fitting. While aesthetically pleasing and of high visual quality, the landscape is not highly valued as scenery because it is extensive and lacks variety.

Landscapes modified by mining coal are evident and are perceived locally as a part of the land use pattern.

Whereas the aesthetic surface of modified landscapes may not be considered pleasing, coal mining has a "fit" in the character of the land and is not, therefore, a cause for trauma either to local populations or to those passing through the area.

The tract area is not noticeable from the major local population center, Garrison.

WILDLIFE

This area is located in the glaciated Missouri Coteau which is some of the most productive pothole wetlands country in the world. Wetlands comprise 8.2 percent of the area, woodlands 2.9 percent, native prairie 19.7 percent, agriculturally disturbed 69.2 percent, the remainder is mined areas, roads, farms, and other land uses. The three essential wildlife habitats, wetlands, woodland, and native prairie, comprise 30.8 percent.

Douglas Creek and its tributaries flow south from the area to the Garrison reservoir. These watercourses are in excellent condition, and are bounded by woodlands and wide expanses of native prairie. Low stream gradients result in broad wetlands and plentiful surface water.

Wetlands provide essential habitat for 22 sensitive wildlife species, and the interspersed woodlands, native prairie, and wetlands provide essential habitat for 31 sensitive species (Table 6). Whooping cranes an endangered species, use this area extensively during their annual spring and fall migrations. It is the combination of essential habitats that provides the greatest amount of edge, has the highest wildlife diversity, and highest wildlife populations. One expression of these values is that the U.S. Fish and Wildlife Service has all or major portions of 19 sections of essential habitat under Wetland Easements within this coal tract.

Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

The remnant wildlife habitats, either singly or interspersed, are the result of 60-70 years of intensive farming of all suitable farmland, with limited exception. These residual wildlife habitats are the best habitat in the area.

Native grasslands represent relics of the original prairie ecosystem. Unplowed prairie is only 20 percent of the original North Dakota total.

There are no sensitive fish, amphibians, or reptiles identified in this area. There are sensitive fish in the Garrison reservoir and the Missouri River downstream of the area.

TABLE 6
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

CULTURAL RESOURCES

There is a higher likelihood of recording historic rather than the prehistoric resource from the tract when it is inventoried. To date, no systematic survey has been conducted. Therefore, specific comments cannot be made.

Cultural resource information has been collected in the general vicinity of the tract. Where this collection has taken place, conclusive information is not available. However, it is likely that the sites found will be task specific and exploitative in nature (i.e., bison kill sites; lithic scatters of varying size, density and function; seasonal and long-term habitation).

The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has possibly disturbed some cultural resources from earlier times.

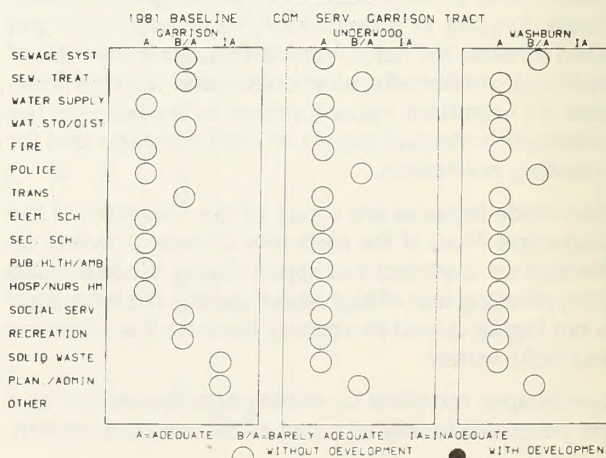
ECONOMIC AND SOCIAL CONDITIONS

Existing and forecasted population and employment levels for the communities of Garrison, Underwood,

and Washburn, North Dakota are shown in Figure 3 (Mountain West 1981). As this figure shows, future population levels in Garrison, without the leasing of federal coal (refer to dashed line), are expected to remain relatively stable until the early 1990's and then gradually decline through 2000. Underwood and Washburn population levels show considerable fluctuations through the early 1990's due to energy developments not directly related to federal coal leasing.

Figure 1 shows the present (1981) condition of public services in the three communities. All services in

FIGURE 1



SOURCE: Respective city/county or regional planners.

Underwood and Washburn are considered to be adequate or barely adequate while Garrison has inadequate solid waste disposal and planning and administration for its present population.

The adequacy ratings in Figure 1 reflect assessments by regional planners and town councils. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

Twenty five McLean County residents were interviewed by BLM representatives. The major service shortfalls identified by these persons were medical care, retail opportunities, and road problems.

Support for coal mining appears to be very strong among residents of McLean County. Roughly 80 percent of the twenty-five persons interviewed support additional mining either with or without qualification. The reasons given for this support include the national need for coal, use of an available resource, and the opportunities for enhanced local employment. Protection of agricultural land was mentioned both as a concern and as reasons for opposing mining. Reclamation is the major issue among persons in McLean County. Others are air quality and the potential for local social disruptions due to population growth associated with mining.

Officials in McLean County were supportive of additional mining, a pattern very similar to that found in the general population. The reasons were also similar. The need for local economic development and the need to respond to the national energy situation were listed by officials as the reasons for supporting development. The major concern of interviewed officials in McLean County centered upon the relationship between landowners and companies.

McLean County residents appreciate both the natural and the social environments of the area. Opportunities to hunt and fish, and the aesthetics of the area were presented as favorable natural characteristics. In addition, the informal, friendly, supportive, and uncrowded social environment also emerged as a significant feature that is pleasing to residents. Negative factors mentioned by a small number of residents center upon the unavailability of community services, particularly entertainment facilities, and harsh climate of the area.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data available from surrounding stations are shown in Tables 7 and 8. The Garrison tract is located north of the meteorological station at Garrison and within the National Weather Service (NWS) West Central Region. The meteorological station at Garrison will be used to establish benchmark climatology for the tract.

The annual mean temperature for the area is 39°F with a highest monthly mean temperature of 70°F (in July), and a lowest monthly mean temperature of 8°F (in January). The average growing season is approximately 123 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 15.86 inches at Garrison, and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Garrison station is 24 inches.

Wind data used for this analysis were obtained from the Minot climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 2 represents a summary of this data. Winds prevail from the W to NW at Minot (29 percent frequency of occurrence). Wind speeds average 12.7 mph and exceed 11.5 mph 46 percent of the time.

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum L. J., J. W. Enz and J. M. Ramirez 1978).

Table 9 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m³ (at Garrison) to 32 ug/m³ (at Beulah, rural). The annual geometric mean concentration of TSP at the local privately operated impact source monitoring stations ranged from 21 ug/m³ (at Falkirk Mine) to 44 ug/m³ (at Coal Creek). For purposes of the following computer analyses, the background rural TSP levels will be set at 24 ug/m³ for the annual level and 100 ug/m³ for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO₂ increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 7*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Garrison	Max	Riverdale	Raub (12 SSW)	Minot (FAA)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	39	38.7	40	41.6	40.1	40.6
$\bar{X}$ monthly low (Jan)	8	5.5	9	9.4	7.9	8.4
$\bar{X}$ monthly high (July)	70	68.5	70	70.0	70.9	69.4
Average growing season (temp. 32° F), days	123	126	134	114	132	120
Precipitation, in.						
Annual average	15.86	17.67	17	14.80	17.24	16.91
Monthly range	0.45-3.55	0.46-4.04	0.4-3.4	0.31-3.55	0.53-3.66	0.40-3.92
Annual snowfall	24	30	24	26	35	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					10.6	
Class D					66.6	
Class E, F					22.8	
Wind direction, (%)					W-NW(29)	
Wind speed, mph (% of time)					0-3.5 (5.9) 3.6-6.9 (15.7) 7-11.5 (32.5) 11.6-18.4 (29.5) 18.5-24 (12.5) >24 (4.0)	
Average wind speed, mph					12.7	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

TABLE 8
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

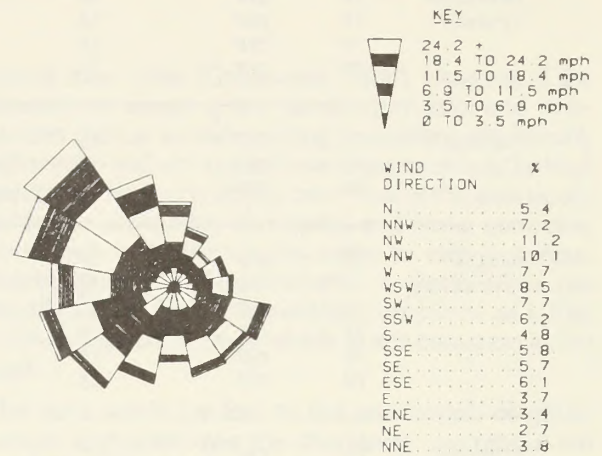
	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:

Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

FIGURE 2



WIND ROSE FOR MINOT NORTH DAKOTA

TABLE 9
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m ³)	2nd Max. Observation (ug/m ³)	Annual Geom. Mean (ug/m ³)	Annual Arith. Mean (ug/m ³)
<u>State-Operated Sites</u>							
Garrison (rural)	76	TSP	58	176	105	28	39
	77	TSP	58	245	132	23	33
	78	TSP	54	69	58	16	20
	79	TSP	36	47	47	15	20
Parshall	76	TSP	55	76	67	19	26
	77	TSP	53	109	91	20	26
	78	TSP	35	77	62	17	24
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
<u>Privately-Operated Impact Source Monitoring Sites:</u>							
Coal Creek #1	79	TSP	37	242	190	37	56
		SO ₂	8106	162	136	<5	<5
	80	TSP	58	413	232	36	57
		SO ₂	7681	212	175	<5	<5
Coal Creek #2	79	TSP	37	404	229	44	76
		SO ₂	7710	423	394	<5	<5
	80	TSP	61	533	299	40	63
		SO ₂	8172	89	89	<5	<5
Coal Creek #3	79	TSP	37	115	105	35	44
		SO ₂	6446	185	120	<5	<5
	80	TSP	60	578	222	35	52
		SO ₂	7994	358	243	<5	<5
Falkirk #1	79	TSP	43	246	110	24	37
	80	TSP	34	161	126	35	48
Falkirk #2	79	TSP	46	139	99	21	32
	80	TSP	36	94	92	23	32
Falkirk #3	79	TSP	46	196	115	29	42
	80	TSP	37	151	149	38	52
Falkirk #4	79	TSP	43	113	97	24	36
	80	TSP	38	132	85	26	35

*SOURCE - North Dakota State Department of Health

CHAPTER III

ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of the land would be modified during surface mining. Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards. Until such time that natural vegetation could be reestablished, accelerated erosion forming scars on the land would be potential problems.

GEOLOGY AND MINERALS

The major impact of the leasing alternative would be the removal of 259.3 million tons of coal. Mineral resource conflicts might occur between development of oil and gas and of the coal since the tract is located in the Williston Basin, which is being extensively explored at this time.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management planning documents (URA, MFP) and the West Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts if mining proceeds are the disruption of the present soil bodies, with temporary loss of productivity and problems with erosion, compaction, and instability.

Soil erosion and compaction would not be new to the area because of dryland agricultural activity and coal mining that already exists. About 34 percent of the tract is annually cropped with 25 percent of the total tract left bare of protective cover due to summer fallowing. Existing erosion and compaction impacts would therefore continue with or without the presence of an active mine. They should not cause significant detrimental effects to the soil resource if the required stipulations are followed.

Some instability problems usually appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called

pipng may occur (Groenwald, 1980). However, if the stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, these impacts should be kept minimal. The gentle slopes over most of the area would aid in the workability of material and make corrective measures on problem spots easier to carry out. Also, overburden with large amounts of glacial till is not usually as susceptible to instability problems as is that from clayey, sodic shale which is not common in the tract.

The soils would be lost to the production of grass, forage, and grain over the short-term use (about ten years for each annual disturbance of 422 acres) of the tract for coal mining. This loss would occur only on the active portion of the mine at any given time. Once in full operation, the total tract area out of production in any peak mining year is estimated at 4,200 acres. Soils would be continuously replaced on mined out areas and brought back into production during the life of the mine (40 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research (SEA-AR) of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station (NDSU-AES) of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power, 1974).

With a good reclamation effort, successful return of agricultural productivity over this tract should be possible. Table 2 (Chapter 2) indicates that most landowners have sufficient acreage of soil rated "good" and "fair" for supplying cover soil material in surface mine reclamation. However, there are five separate parcels that have nearly half or more of their acreage rated "poor." These may require a very intensive reclamation effort to ensure successful rehabilitation. If enough suitable plant growth material can be borrowed from the overburden and/or better soils on individual landowner tracts to improve the areas rated "poor," it should be possible to increase the overall productivity on these parcels.

Consideration should be given to avoiding the Middle Branch of Douglas Creek drainage. The steep slopes and saline bottomlands would make it difficult and expensive to mine and reclaim. About 750 of the 1160 acres rated "poor" in the tract are concentrated in this drainage.

HYDROLOGY

During mining, all of the surface runoff from this disturbed area must be impounded and not released until it meets specified quality standards. An exception to this is when storm runoff exceeds the design capacity of the reservoir. Water that collects in open mine pits is also often pumped into these surface water reservoirs. Water which is released from the impoundments would generally have less suspended solids, higher dissolved solids and higher sodium adsorption ratios. At this time it is impossible to predict exactly how much difference there would be in these water quality constituents.

There are several areas that are closed basins within this tract. These basins support ephemeral or temporary wetlands.

During mining the wetlands would be destroyed. The local groundwater system is dependent upon the wetlands for recharge. In order to maintain post mining recharge similar to the premining system, these wetlands must be recreated.

The lignite which forms an aquifer in this area would be mined. Also, sand bed aquifers just above the lignite would be destroyed. A sand bed just below the lignite may also be disturbed. While the mine pits are open, water levels in these disturbed aquifers would be drawn down in the area surrounding an open pit. The distance from an open pit that this drawdown would occur and the amount of drawdown at a particular well, would depend upon the local aquifer characteristics.

Most of the water wells in the tract tap a sand or lignite bed in the vicinity of the mineable lignite. These wells would experience a water level drawdown. The wells finished in this zone that are located on the north and east edges of the tract may also experience a water level drawdown. The wells finished in the buried valleys to the west and south of the tract would not be significantly impacted. The uses of water that would be disrupted would include domestic and livestock supplies.

The flow pattern of groundwater through the area would also be disrupted. The open pit would act as a groundwater sink. During mining this effect limits all groundwater quantity and quality impacts to the area included within this cone of depression around the open pit. Water levels over the entire tract and adjacent areas would not change everywhere at once. It would be a progression as mining moves through the area.

Once the overburden is replaced in the pit, the drawdown stress would begin to subside and approach a post mining equilibrium. The flow patterns of groundwater would still be different than under premining conditions. Generally, water would not be as available from the replaced overburden under post mining conditions. The lignite and buried valleys in the area surrounding the tract would still be viable aquifers. Water

would move between these areas and the replaced overburden as part of the new post mining hydrogeologic system.

The physical disturbance caused by a mining action can also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenewold (1979 and 1980) at other mines in North Dakota with similar overburden. These changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in replaced overburden would be degraded. So little water moves through this mined zone as compared to the amount of water in the buried valley, that no significant impact is anticipated on the buried valley aquifer.

The mining company would be responsible for the replacement of any degraded water supply. Replacing water sources would probably mean drilling to deeper aquifer levels. There is not sufficient information to describe exactly how deep a replacement supply is, but deeper aquifers that would not be impacted by mining are known to be in the area. Another alternative would be to use water from Lake Sakakawea.

Associated with these deeper replacement wells would be higher operating and maintenance costs to the local water users. Also, any additional wells needed in the future after the mining company has fulfilled its replacement obligations and left the area would cost more to drill. The cost of these additional wells would not be paid by the mining company.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 422 acres of the total tract area per year from its current uses. The major use of these lands is agricultural production. The first land taken out of agricultural operations, except for the plant site and ancillary facilities, would occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 40 year period.

Mining of any one location would be the land use for one to five years depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing topsoil.

The company would be under bond for at least ten years to as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored to equal or better than it was before mining (Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service and North Dakota State University—Agricultural Experiment Station indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing development alternative would have a significant short-term impact on individual agricultural operations, which include land over federal coal, in the tract. By the end of the 40-year mine life, 16,872 acres of the tract would be disturbed, in addition to 240 surface acres used for mine facilities.

An average of 160 acres of cropland, excluding 4,204 total acres of summer fallow, would be removed from production each year. This would be an average annual loss of 4,592 bushels of wheat. This 160 acres of cropland would be out of production ten years with a maximum of 1,607 acres out of production in any one peak mining year, resulting in a maximum loss of 46,120 bushels of wheat annually.

Peak mining year disturbance of 385 acres of hayland on operations with land over federal coal would result in an annual loss of 751 tons of hay production.

An average of 118 acres of rangeland, on operations which include land over federal coal, would also be removed from production each year, resulting in an average loss of 71 AUMs. This 118 acres of rangeland would be out of production ten to fifteen years with a maximum of 1,175 acres out of production in any one peak mining year, resulting in a maximum annual loss of 705 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's doing agricultural data collection on the preliminary logical mining unit instead of the present tract. The data may not completely represent the tract in its final form.

In the reestablished native-type range it is likely that some introduced species would be used. The laws require that introduced species be of the same seasonal variety and of equal or superior utility as the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Mining in the Garrison tract would physically displace agricultural use for up to ten years during active mining and reclamation. Roads and utilities would be bypassed or relocated creating minor inconvenience in the local area. Growth of local communities resulting from increased employment due to the mine would require some expansion of residential land use and commercial development. This development would likely displace some agricultural use of areas adjacent to these communities.

All impacts to land uses currently on the tract can be considered short-term. No long-term impacts should affect the tract area itself. Growth of nearby towns, however, should be considered long-term.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) would damage recreational hunting. From the recreation perspective, it is unlikely the loss would be unmanageable.

Social and economic studies have documented demographic changes resulting from mining that would stress Garrison, North Dakota, and other communities in the vicinity of the tract. This stress would be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure would be seen on private and public land because of recreational opportunities lost to mine-related impacts.

AESTHETICS

The effect of coal mining on the tract would not be particularly noticeable by a large number of people. With reclamation according to State and Federal law, the impact of coal mining would have a negligible effect on scenic values for the short-term and long-term. The effect on aesthetics would be a decline in quality for the short-term and restoration of a condition similar to that existing in the long-term.

WILDLIFE

Coal mining and attendant actions would severely disrupt and destroy significant wetlands habitat for sensitive and other species of wildlife in the area. On-site effects to wildlife would be degradation and loss of the three essential habitats: wetlands, native woodlands, and remnant interspersed native prairie which in composite provide habitat for 31 sensitive wildlife species. Agriculturally disturbed areas are of low wildlife habitat value, but do provide spring and fall feeding and loafing habitat for migratory waterfowl and shorebirds.

The areas identified on the Map 3 (Chapter Two) are those which represent the highest sensitive wildlife habitats. The 19 U.S. Fish and Wildlife Service Wetland Easements in the coal tract are not shown and are not subject to coal leasing by BLM.

There would be a significant area loss to wildlife resources if mining occurs in these essential habitats and they are not replaced in full.

Additional degradation of similar habitats would be expected adjacent to the mine. Off-site habitats, specifically the aquatic and associated woodlands-native prairie, would be affected.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparian woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those reclaimed areas until the disturbances are eliminated. This may be for the life of the mine and reclamation period.

Increased human populations resultant of mine development and operations generally reduce wildlife populations and habitat locally and offsite by poaching, road kills, increased legal harvest, disturbance of reproductive and migratory periods and habitats, harassment by recreationists, and feral and uncontrolled cats and dogs, and degradation and complete loss of habitat due to housing, shopping centers, waste treatment plants, and similar urban development.

Poaching and road kills have increased dramatically in areas of Montana, Wyoming and Colorado where energy development has occurred. The problem is compounded in areas where shift changes of workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjusting the times of shift changes

which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help.

To date successful reclamation of native woodlands, and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Successful reclamation of Native prairie has yet to be demonstrated, although some prairie plowed about 70 years ago and since left undisturbed has had some native plant species reestablishment.

Concurrent replacement of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the lesser negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands is expected to become a permanent loss.

At present natural, biologically viable wetlands (e.g., potholes) have not been fully reclaimed in North Dakota. It would be most productive and conservative to eliminate mining from the larger wetlands thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable commitment of wildlife resources.

An interagency team of wildlife biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter 2). Formal recommendations have been received by BLM from the other two agencies. Joint agreement between the agencies and final decisions on unsuitability, exemptions such as producing leases, and exceptions will be completed in August 1981.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. These secondary impacts can include vandalism increased by improved access, loss as a result of erosion or degradation resulting from disruption of natural setting.

In the event of lease, stipulations covering cultural resources would have to be developed. These stipulations would have to treat both recorded and unrecorded sites. They would also require management

plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these options are not viable, then scientific data recovery programs would have to be developed.

ECONOMIC AND SOCIAL CONDITIONS

Construction and operation of the Garrison tract should not result in significant impacts upon services in communities within the area as a result of population growth associated with employment opportunities. Due to the location of the tract, construction and operation workers are expected to relocate in at least twelve communities within the area (Mountain West Research 1981). Due to this dispersion, additional demands placed upon public services in any one community are expected to be minimal. Garrison, Underwood, and Washburn are expected to receive the greatest population influx associated with tract development. As figure 3 shows, Underwood and Washburn are expected to receive moderate population growth while the increases to Garrison are considerably smaller.

Peak employment during the construction phase of the Garrison tract is expected to occur in 1987 at 200 employees with full operations employment expected in 1991 at 270 employees. Using these two years as primary impact dates, it is estimated that the communities of Garrison, Underwood, and Washburn would not experience an inadequate level of community services as a direct result of peak construction or full operations employment/population levels (McLean County Meeting, May 20, 1981).

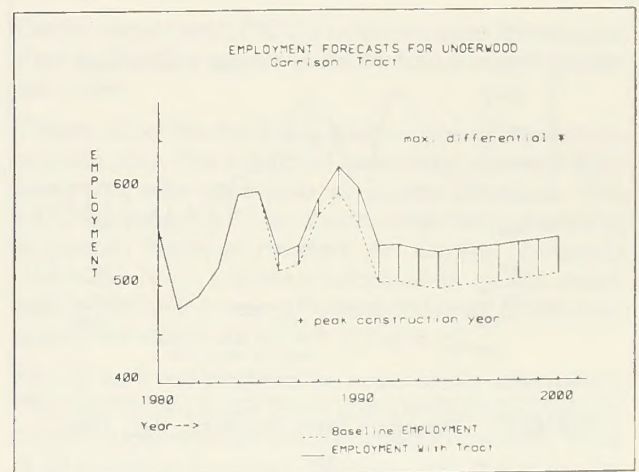
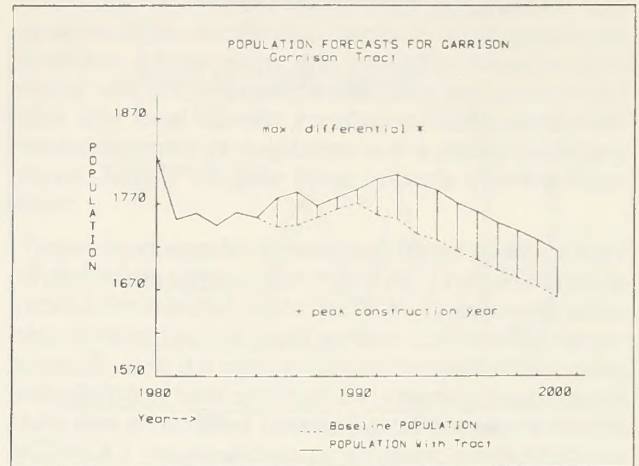


FIGURE 3

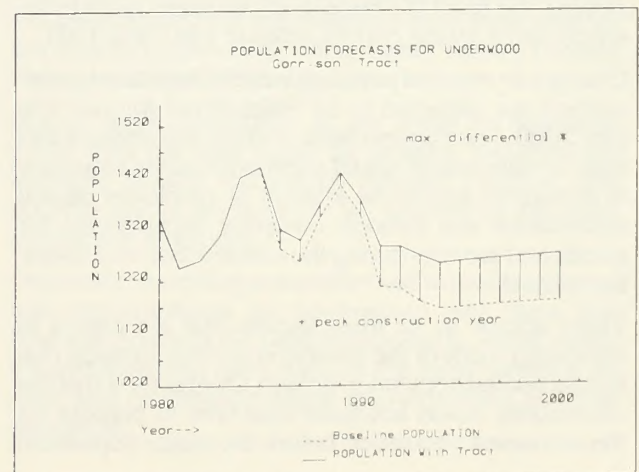
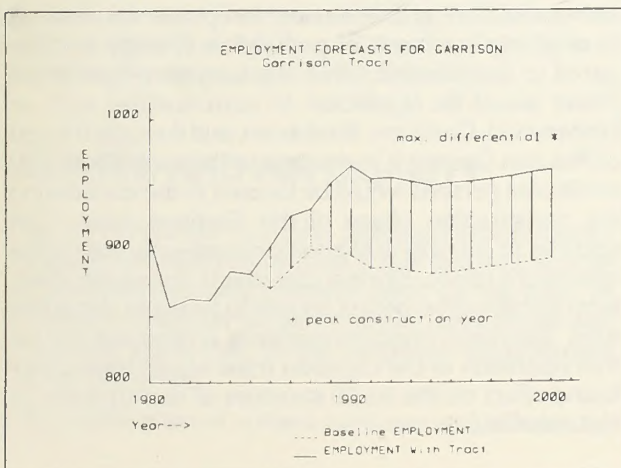
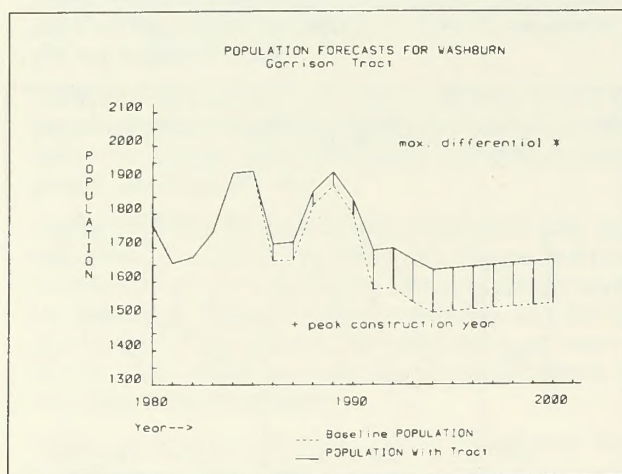
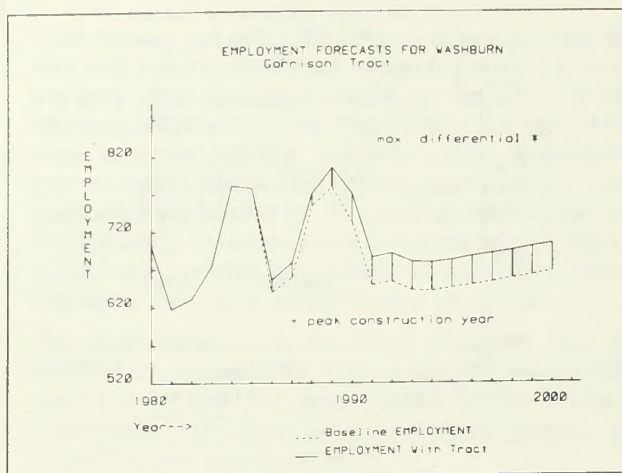


FIGURE 3 (continued)



SOURCE: Mountain West Research, Inc., 1981.

Statements made regarding community service adequacy with population increases reflect assessments made by regional planners and town councils. It should be recognized that best judgments were made concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1987 and 1991.

Changes in regional personal income from tract development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditure and through company expenditures for goods and services during the construction and operation phases.

There appear to be three factors that are critical in mitigating many of the adverse economic impacts due to coal related population growth. One factor is that the community needs adequate lead time to prepare for the increased population before the major population

influx occurs. The second crucial mitigation factor is the availability of planning expertise to assist the community in designing and implementing a planning strategy to accommodate the increased population. The third factor is adequate financial assistance to carry out the needed community service improvements in a timely manner.

The BLM can make recommendations regarding leasing dates to allow lead time for community planning. The Regional Coal Team and Secretary of Interior can also recommend certain leasing dates. The Bureau recommendations on leasing dates will be made during the EIS phase after tract ranking has occurred.

The affected counties and communities may also be able to obtain planning and financial assistance through state agencies such as the North Dakota Energy Impact Office and federal agencies such as the Farmers Home Administration and Department of Housing and Urban Development. At this time, it is not known if the impacted communities would actually be able to acquire the needed planning and financial assistance. This is dependent upon Congressional budgeting action and total demand for energy impact assistance.

During the peak construction period of the Garrison mine, much of the new population would be located in both the Bismarck-Mandan area (Burleigh and Morton counties) and the Minot area (Ward County). These two areas, Bismarck-Mandan and Minot, are, relative to other area communities, quite large, diverse, and consequently capable of absorbing relatively large numbers of new residents. At the same time, the absolute population effects are somewhat deceptive since both Bismarck-Mandan and Minot are large enough so that these population increases (above baseline) are in the range of one to two percent. Therefore, it is not expected that significant social structural changes would be caused by the Garrison mine in either of these two locations. This applies to both the short-term construction and the long-term operations phase of the proposed mine.

In McLean County the construction phase would result in relatively low levels of population change as compared to the baseline, while the long-term operations phase would be significant. In communities such as Underwood, Garrison, Washburn, and through the rest of McLean County, it is anticipated that only about 200 additional persons would be located in the area during the construction phase of the Garrison mine. This equates to roughly 400 additional persons during the operations phase. Since social effects during the short-term construction period appear to be more disruptive than long-term operations effects, it does not appear that operation of the Garrison mine would have a profound effect on the social structure of communities in McLean County.

The institutional and organizational characteristics of these communities would likely not be affected either during the short-term or the long-term to any great extent. McLean County is already fairly diverse economically and socially and has experienced coal development in the recent past. The communities of Underwood and Washburn have already undergone some changes due to this development. Garrison would be facing coal development-induced change at a significant level for the first time. But the population increases in Garrison are projected to be quite low for both the short and long-terms.

For these reasons, it is not expected that the Garrison mine would have pronounced social effects in McLean County (and in the Bismarck-Mandan and Minot areas).

Population changes attached to development in McLean County would have some adverse affects on the perceived quality of life in the area. These changes would likely not be traumatic, but they would be noticeable to many residents. The additional population levels would mean some alteration in the existing social environment as well as the future environment without the mine. There would likely be more pressure on outdoor recreational opportunities which might reduce the satisfactions of some persons who presently enjoy these activities. It is unknown as to whether or not the population levels attached to the Garrison mine would attract significant additional service firms to these communities, particularly entertainment. However, it appears unlikely, since the population levels would remain fairly low.

Technical reports are available which discuss the methodology used in the economic and social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,424.8 Btus. The ratio of energy produced to that expended is 170.4 Btus/1Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due

to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from the BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 10.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment). Table 11 shows Federal and State PSD standards.

During peak production of the mine an estimated 2,901 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

TABLE 10
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

Federal Ambient Air Quality Standards (UPA)				North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m ³	75 ug/m ³	60 ug/m ³	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m ³	260 ug/m ³	250 ug/m ³	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard.)			15 tons/sq. mile 30 tons/sq. mile	Max. 3-month arithmetic mean in residential areas Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m ³)	60 ug/m ³ (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m ³)	260 ug/m ³ (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m ³)		715 ug/m ³ (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO ₂ /100 cm ³ /day	Max. annual arithmetic mean
				0.50 mg SO ₂ /100 cm ³ /day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m ³ 12 ug/m ³	Max. annual arithmetic mean Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m ³ 12 ug/m ³ 30 ug/m ³	Max. annual arithmetic mean Max. 24-hr. conc. not to be exceeded over 1 percent of the time Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 10 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

Federal Ambient Air Quality Standards (UPA)				North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m ³ (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m ³ (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m ³)	9 ppm (10 ug/m ³)	10 ug/m ³ (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m ³)	35 ppm (40 ug/m ³)	40 ug/m ³ (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm ₃ (235 ug/m ³)	0.12 ppm ₃ (235 ug/m ³)	235 ug/m ³ (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm ₃ (160 ug/m ³)	.24 ppm ₃ (160 ug/m ³)	160 ug/m ³ (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm ₃ (100 ug/m ³)	.05 ppm ₃ (100 ug/m ³)	100 ug/m ³ (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m ³ (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m ³	1.5 ug/m ³	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

TABLE 11
FEDERAL AND STATE PSD STANDARDS

Major Sources, subject to PSD review (excludes fugitive dust emissions) (t/yr)	Federal ¹ 100 ² 250 ²	State ³ 100 ⁴ 250 ⁴
Major Sources, not subject to PSD review-counts against PSD increment (considers fugitive dust emissions) (t/yr)	100 ¹ 250 ²	100 ³ 250 ⁴
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean ₃ (ug/m ³)	5	5
24-hour maximum (ug/m ³)	10	10
Class II		
annual geometric mean ₃ (ug/m ³)	19	10
24-hour maximum (ug/m ³)	37	30
Class III		
annual geometric mean ₃ (ug/m ³)	37	37
24-hour maximum (ug/m ³)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean ₃ (ug/m ³)	2	2
24-hour maximum (ug/m ³)	5	5
3-hour maximum (ug/m ³)	25	25
Class II		
annual arithmetic mean ₃ (ug/m ³)	20	15
24-hour maximum (ug/m ³)	91	91
3-hour maximum (ug/m ³)	512	512
Class III		
annual arithmetic mean ₃ (ug/m ³)	40	40
24-hour maximum (ug/m ³)	182	182
3-hour maximum (ug/m ³)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC Requirement for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.

The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 5.3 ug/m^3 . This level does not exceed the allowable Class II PSD annual increment for particulates. With the annual background concentration added (22 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

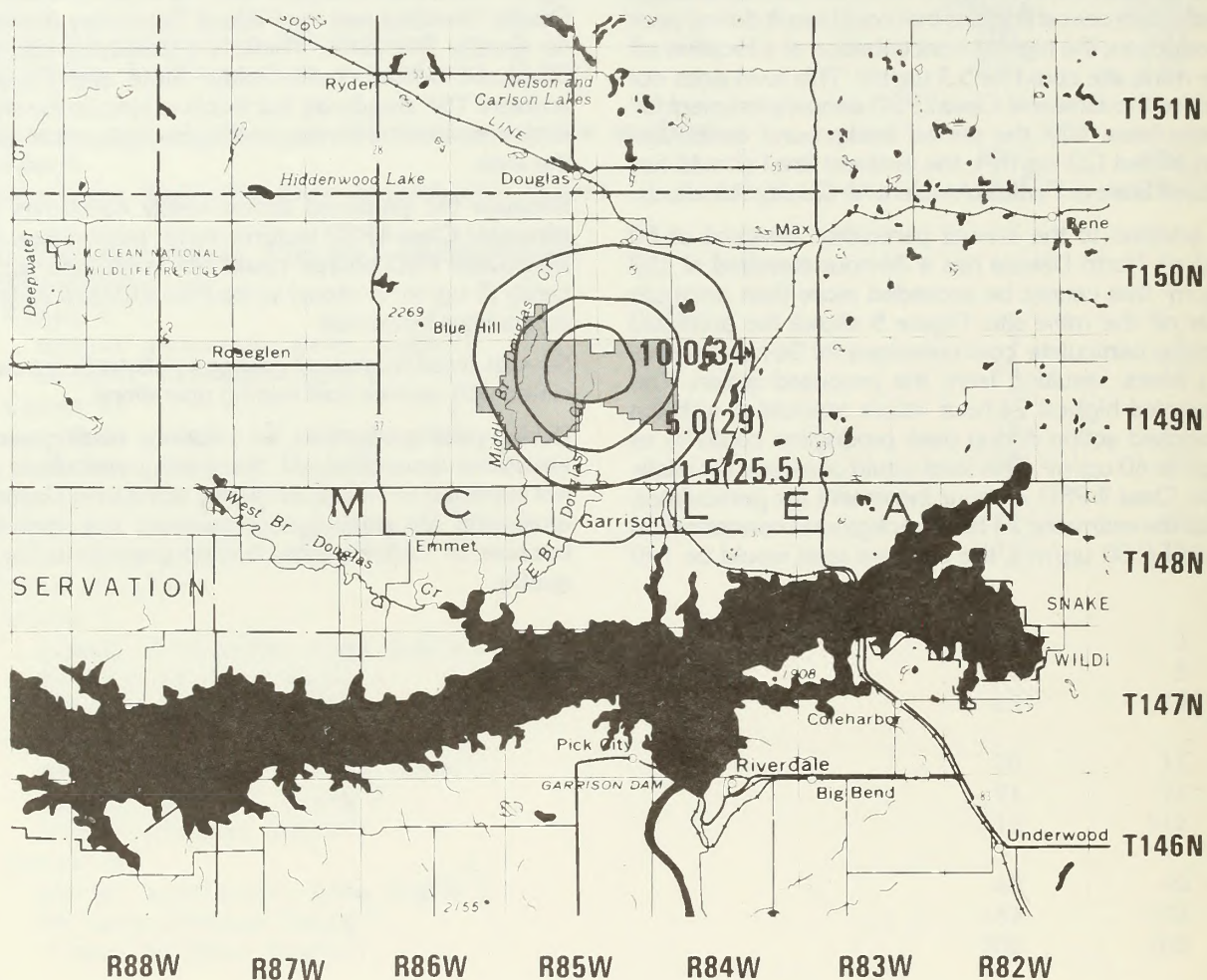
In addition to the annual particulate standard of 60 ug/m^3 , North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 40 ug/m^3 . This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 140

ug/m^3 . This level complies with the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standards. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly ($5 \text{ ug/m}^3 \cdot 24\text{-hour}$) to the PSD's Class II 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.



Scale 1:500,000

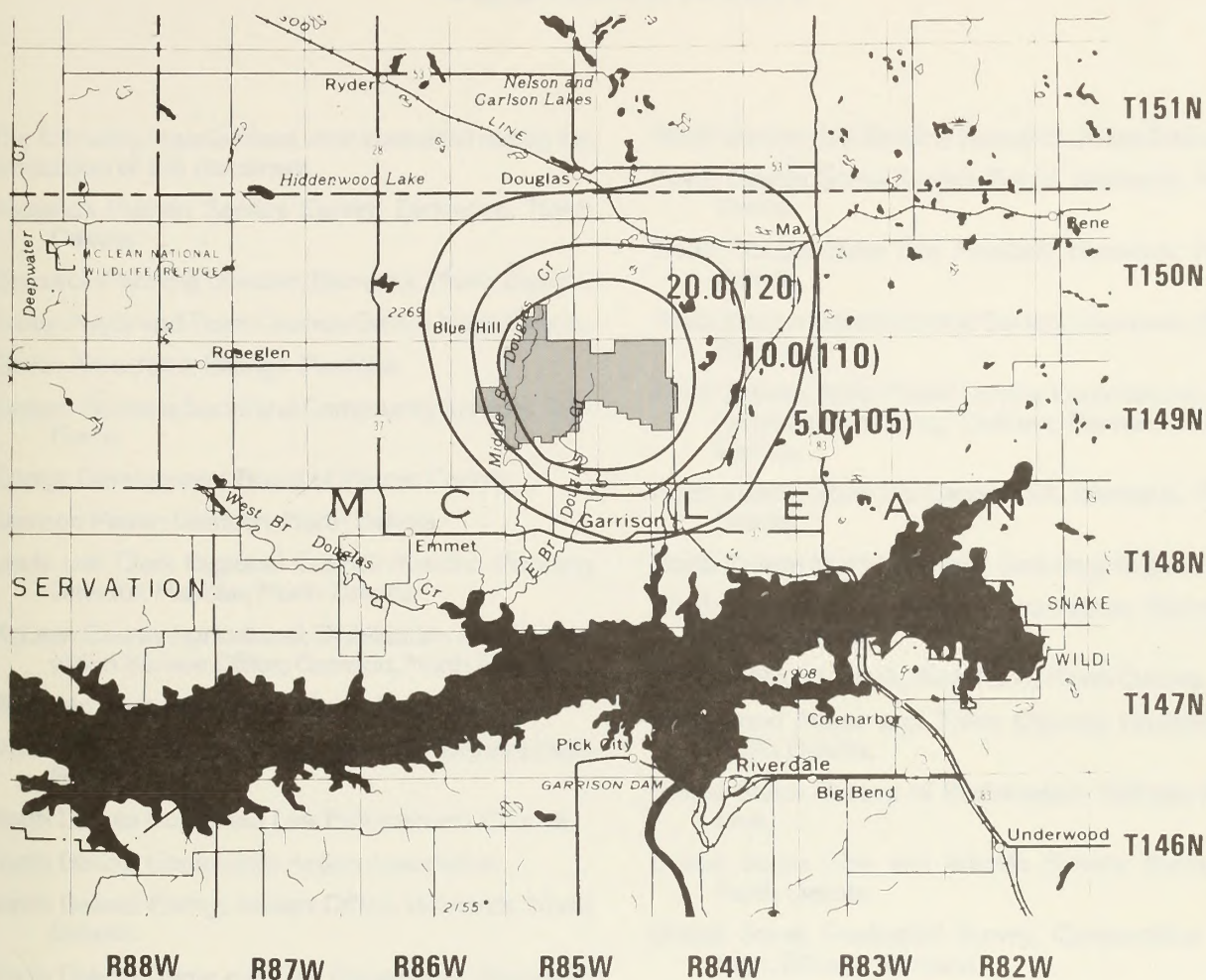


Garrison Tract

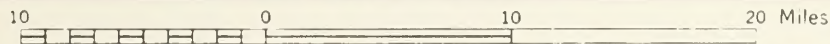
TSP Annual Average Concentration (ug/m³) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



Scale 1:500,000



Garrison Tract

TSP Maximum 24-hour Concentration ($\mu\text{g}/\text{m}^3$) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Garrison Mayor; Garrison, North Dakota.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

McLean County Agricultural, Stabilization and Conservation Service Office; Garrison, North Dakota.

Mountain West Research; Billings, Montana.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

Underwood Mayor and Town Council; Underwood, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service; Bismarck, North Dakota.

United States Geological Survey, Conservation Division; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Dakota.

University of North Dakota, Office of Rural Health.

Washburn Mayor; Washburn, North Dakota.

REFERENCES

- Brum, L. J., J. W. Enz and J. M. Ramirez. 1978. The implications of coal development on the atmospheric environment and plant ecosystems of selected sites in Western North Dakota (Climatology of Inversions). Final report to Surface, Environment and Mining (SEAM). U.S. Forest Service, Cooperative Agreement No. 16-418-GR. Department of Soils, NDSU Agricultural Experiment Station. 58 p.
- Davis, L.B. 1977. Archaeological Photo Interpretation and Feasibility Study of a Five County Area in West Central North Dakota Using Small Scale (1:80,000) Aerial False Color Infrared. U.S. Bureau of Land Management. Dickinson.
- Dill, C.L. 1975. 1975 Archaeological and Historic Site Survey of the Falkirk Mining Company Mining Plan Area. McLean County, North Dakota. State Historical Society of North Dakota. Bismarck.
- Good, K. et al. 1978. Archaeological Test Excavations at the Anderson Tipi Ring Site (32 Mc 111) McLeann County, North Dakota. University of North Dakota. Grand Forks.
- . 1979. Archaeological and Historical Survey of Proposed Mining Development Area, Falkirk Mining Company. University of North Dakota. Grand Forks.
- . 1981. Evaluation of Significance of Three Recorded Historic Sites, 32 Mc 138, 32 Mc 139 and 32 MI 140 Near Underwood, North Dakota. Historical and Archaeological Surveys Inc. Grand Forks.
- Groenwald, G.H. and R.W. Rehm. 1980. Instability of Contoured Surface-Mined Landscapes in the Northern Great Plains: Causes and Implications, in Adequate Reclamation of Mined Lands? March 26-27. Paper No. 2:1-15. Billings, Montana.
- . et al. 1979. Geology and Geohydrology of the Knife River Basin and Adjacent Areas of West Central North Dakota. North Dakota Geological Survey R.I. No. 64.
- . 1980. Potential Hydrogeochemical Impacts of Surface Mining in the Northern Great Plains. in Surface Mining Hydrology, Sedimentology, and Reclamation. University of Kentucky. Lexington.
- Inter-Industry Technical Assistance Team. 1980. Mercer County Socio-Economic Impact Mitigation Assessment. Volume VI. Typewritten.
- Jensen, R. E. 1972. Climate of North Dakota. North Dakota State University. Fargo. 48 p.
- Klausing, Robert L. 1971. Ground Water Basic Data McLean County, North Dakota. U.S. Geological Survey, Water Resources Division. Bismarck.
- . 1974. Ground Water Resources of McLean County, North Dakota. U.S. Geological Survey, Water Resources Division. Bismarck.
- Morin, K. 1979. The Geohydrology and Hydrogeochemistry of the Proposed Garrison Lignite Mine. M.S. Thesis, University of North Dakota.
- Mountain West Research. 1981. Computer printouts containing populations and employment forecasts. Unpublished.
- National Ambient Air Quality Standards. 1978. Title 40 CFR, Part 50.
- North Dakota Air Pollution Regulations. 1978. North Dakota Ambient Air Quality Standards. Chapter 33-15-02.
- North Dakota Crop and Livestock Reporting Service. 1980. North Dakota Agricultural Statistics. North Dakota State University Agricultural Experiment Station and United States Department of Agriculture, Economics, Statistics Service. Fargo.
- North Dakota Game and Fish Department, U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service. 1981. Wildlife Unsuitability Criteria Application Report and Recommendations. Dickinson, North Dakota.
- North Dakota Public Service Commission, Reclamation and Siting Division. 1980. Rules and Regulations Adopted by North Dakota Effective August 1, 1980 Governing the Reclamation of Surface Mined Lands Under Chapter 38-14.1 of the North Dakota Century Code. State of North Dakota. Bismarck.
- North Dakota Crop & Livestock Reporting Service. 1980. North Dakota Agricultural Statistics, 1980. North Dakota State University, Agricultural Experiment Station and U.S. Department of Agriculture Economics, Statistics & Cooperative Service. Fargo.

Pedco Environmental, Inc. 1978. Survey of fugitive dust from coal mines.

Power, J. F. et al. Can productivity of Mined Land be Restored in North Dakota? North Dakota Agricultural Experiment Station Farm Research. 31:30-32.

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC.

Ramirez, J. M. 1972. The agroclimatology of North Dakota, Part 1. Air temperature and growing degree days. Extension Bulletin No. 15. North Dakota State University. Fargo. 30 p.

. 1973. The agroclimatology of North Dakota, Part 2. Precipitation: forecast probabilities and rainmaking. Extension Bulletin No. 16. North Dakota State University. Fargo. 44 p.

. and T. Method. 1976. An air pollution climatology of a seven county area in Western North Dakota. Final report to North Dakota State Department of Health. Cooperative Agreement No. 2520-513-5120. Department of Soils, NDSU Experiment Station. 70 p.

Requirements for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.

U.S. Dept. of Agriculture, Soil Conservation Service, 1978. Soil Survey of Mercer County, North Dakota. Soil Conservation Service, Bismarck, North Dakota (1948-1974). Ashville, North Carolina.

. 1979. Soil Survey of McLean County, North Dakota.

. 1971-1980. Official Soils Series Descriptions.

U. S. Dept. of Commerce, National Climatic Center. STAR Data for Bismarck, North Dakota (1948-1974). Ashville, North Carolina.

. 1973. Climatology of the United States No. 81. Ashville, North Carolina.

. 1979. Climatological Data, annual summary, North Dakota. Ashville, North Carolina.

U.S. Dept. of Interior, Bureau of Land Management. 1981. June 1, Center Town Meeting June 1 with Mayor and Town Council of Center, Montana.

. 1981. May 20, McLean County Public Meeting with Mayors and/or Town Council Members of Garrison, Underwood, and Washburn, North Dakota. Unpublished.

. Undated. McLean County Unit Resource Analysis. Unpublished. Dickinson, North Dakota.

U. S. Environmental Protection Agency. 1974. Development of emission factors for fugitive dust sources. EPA-450/3-74-037.

. 1978. Mobile sources emission factors. EPA-400/9-78-005.

. 1979. Compilation of air pollutant emission factors. AP-42.

., Region VIII. 1979. Interim policy paper on the air quality review of surface mine activities.

Waldrun, Dave. 1981. Personal communication. Lewis and Clark Regional Council.

SUMMARY MATRIX
GARRISON TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATIONS

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Knob and kettle.	Less contrasting topography with slight modification of drainage patterns.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified	None	N/A	Good	
Potential for Other Minerals	Low - This tract is located in the Williston Basin so there is some chance of oil and gas.	Low - There is ongoing oil exploration activity in the area.	Mining could interfere with future oil development.	Good	
Paleontological Resources	Low - None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potential	Low over the tract except along the Middle Branch Douglas Creek where water erosion potential is high.	Slight increase with soil handling operations but little overall change.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None		There has not been a need for this data.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to: Untreated steel - High; Concrete - Low.	None	None	Outstanding	
Highly Saline/Sodic Soil Conditions	About 1,000 acres in the tract. Of this, approximately 750 acres is along the bottom of Middle Branch Douglas Creek and remainder along Douglas Creek.	There soils can possibly be improved by replacing with better plant growth material from surrounding soils and/or the overburden. This would mean mining through the Creeks, however, which may conflict with other resources.	Minimal - possible slight increase in productivity.	Outstanding	
Character of Subsurface Materials and/or Interburden	Up to 50+ feet of glacial till over shale and sandstone except along parts of Middle Branch Douglas Creek where the till has eroded off. The glacial till probably has characteristics similar to that found on the Underwood tract which are: Textures - medium and medium fine, pH - neutral to slightly alkaline, salts and sodium - low.	Some instability problems (settling, piping) may appear primarily during the first three years from the onset of reclamation.	Minimal	Outstanding	
Reclamation Potential		Some of the overburden could be used to improve areas with soils rated "poor" for final cover of surface-mined land.	Possible slight increase in productivity of these areas.		
	Based on soil suitability for final cover of surface mined land, the chance for successful reclamation of most individual landowner holdings and for the tract as a whole appears to be high. However, there are five separate parcels indicated on Table 2 that have nearly half or more of their acreage rated "poor". These may require a very intensive reclamation effort to ensure successful rehabilitation.			Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Reclamation Potential (cont.)					
	The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 13,200 acres, 79%; "Fair" - 2,399 acres, 14%; and "Poor" - 1,161 acres, 7%. About 1,000 of the 1,161 acres rated poor are the saline/sodic soils mentioned in the soils portion of the matrix which are concentrated along the bottoms of Middle Branch Douglas Creek (750 acres) and Douglas Creek (250 acres). Consideration might be given to not mining through the creeks especially Middle Branch Douglas Creek which has hilly and steep slopes breaking into the saline/sodic bottom.				
	Precipitation could be a limiting factor for reestablishing vegetative cover some years.				
Hydrology					
Drawdown of Shallow Groundwater Levels	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Wells finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Will affect between 15 and 35 wells used for domestic and livestock purposes.	Hydrology - Outstanding Well Inventory - Acceptable	This will be a short-term impact that will only occur to a few wells at a time as mining progresses through the tract.
Degradation of Groundwater Quality	Lignite water does not meet Public Health Service drinking water quality standards. It is acceptable for domestic and stock water purposes since it is the best practical source.	Groundwater quality will be degraded in the tract and this impact can move down gradient into the surrounding unmined aquifer.	Will affect between 10 and 30 wells used for domestic and livestock purposes.	Hydrology - Outstanding Well Inventory - Acceptable Impact Prediction - Acceptable	The long-term impact of how far down gradient poor water quality will move is not known.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Vegetation					
Cropland	There are 5,804 acres of land in the tract that are currently being cropped.	Average annual loss of 160 acres excluding 4204 total acres of summer fallow. Annual production on this 160 acres would be 4592 bu. of wheat. Maximum loss in any one peak mining year would be 1607 acres and 46,120 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	
Rangeland	Average annual production is 2,819 AUMs.	Average annual loss of 71 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 1175 acres and 705 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	
Agriculture	There are 37 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	35% of the involved operators acreage is in the tract.			Outstanding	
	58% of the acreage in the tract is operated by lessees.	Non-owners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Endangered Species	There are no threatened or endangered species (on the Federal list) in the tract.	None	None	Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Land Use	Agricultural; county roads and local utilities.	Displacement of existing agricultural use in the short term. Relocation or bypass of existing minor roads and local utilities causing minor inconvenience.	See Vegetation and Agriculture sections. Minor.	Acceptable	
		Displacement of existing use for expansion of residential/commercial uses considered permanent.	See Economic and Social Conditions section. Minor in terms of the region.		
Recreation Values	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Aesthetics	Agricultural land. Mining and other uses are evident in the region. High aesthetic quality but common and therefore not valuable as scenery. Mining is perceived as a fitting use.	Short term changes to visual surface; not perceived as being particularly objectionable but less desirable than existing. No impacts in long term.	Moderate to low significance in short term. No long term significance.	Acceptable	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Wildlife					
Sensitive Wildlife and Essential Habitats	Essential habitat for sensitive wildlife ranges from 30-70% of the areas for about 30 species. Whooping crane and northern swift fox are identified with the areas.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 sensitive wildlife and many more common wildlife. Offsite aquatic habitats of Douglas Creek, Missouri River and Garrison Reservoir would be recipients of potential point and non-point pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetland, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDOF & BLM biologists). Wildlife data quality is high.	Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled, it would significantly reduce recreation opportunities.
General					
Cultural/Historical Values	No specific data available. Resources likely on the tract.	Loss of sites as a result of mining activity.	Unable to establish because no specific data is available.	Unsatisfactory because it is not available.	Present plans call for cultural resources survey in summer of 1981.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Net Energy Analysis	No fossil fuels are being produced from this tract.	A total of 6.5 million tons of coal (1.1 million tons of federal coal) will be produced annually.	Production: 6425 Btu/lb. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption: 170:1	Acceptable	
Climate and Air Quality	Good	Totally consumes the allowable class II PSD 24-hour increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly (5 ug/m ³ - 24-hour) to the PSD's class II 24-hour particulates increment.
Social and Economic Considerations					
Employment	Communities of Underwood and Washburn providing adequate services for present employment/population. Garrison has 2 inadequate services with present employment/population.	Employment increases will occur in Underwood, Washburn, and Garrison.	Moderate employment changes in Underwood, Washburn, and Garrison.		
Population	Communities of Underwood and Washburn providing adequate services for present population. Garrison has 2 inadequate services with present population.	Population increases will occur in Underwood, Washburn, and Garrison.	Moderate population changes in Underwood, Washburn, and Garrison.	Outstanding	
Regional Income	\$4560 estimated regional income per capita.	Minor increases in regional per capita income.	Insignificant	Acceptable	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Infrastructure Assessment (Community Services)	Garrison - 2 inadequate services Underwood - 0 inadequate services Washburn - 0 inadequate services	1991 Full Operations Tract related population growth would result in no community services becoming inadequate.	Insignificant	Acceptable	Based on assessment of 15 community services.
Perception of Community Services	McLean County Medical care, road problems and retail opportunities identified as services needing improvement.	Not applicable	Not applicable	Acceptable	
Social Attitudes	McLean 25 interviewees Residents 80% supported coal mining either directly or with qualification Officials Completely supportive of additional mining	Not applicable	Not applicable	Acceptable	
Quality of Life	McLean County Favorable Characteristics -Opportunities to hunt and fish -Area aesthetics -Informal, friendly, uncrowded social environment Unfavorable Characteristics -Availability of community services and harsh climate of the area	-Some alteration of existing social environment -Increase demands on outdoor recreation opportunities may reduce user satisfaction	Changes would not be traumatic but would be noticeable.		

GARRISON TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	Yes	No	No	FWS wetland easements
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	No	No	May be applied at mine plan.
4. Wilderness study	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	Yes	---	Yes	Survey being scheduled.
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Yes, whooping crane and northern swift fox known or believed to use this region.	---	Swift fox data limited.	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	No	---	No	Does not exist.
11. Eagle nests	No	---	No	---

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---		---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	No	---	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	---

PRELIMINARY FACILITY EVALUATION REPORT

SCOPE AND OBJECTIVES

The purpose of this report is to provide a preliminary evaluation of the facility's current state and to identify areas for improvement. The objectives of this report are to:

- 1. Identify the current state of the facility.
- 2. Identify areas for improvement.
- 3. Provide recommendations for improvement.

METHOD

MEASUREMENTS AND VARIABLES

The following measurements and variables were used in the evaluation:

- 1. Facility size (square feet).
- 2. Number of rooms.
- 3. Number of staff.
- 4. Number of patients.
- 5. Number of visits.

PRELIMINARY FACILITY EVALUATION REPORT

GARRISON PRELIMINARY FACILITY EVALUATION REPORT

GOALS AND OBJECTIVES

The Fort Union Regional Coal Team, in its consideration of leasing federal coal, will address the likely coal end-uses and their implications. The purpose of evaluating how the coal will be used is to present the most probable major impacts of development.

The end-use facility evaluations are at a reconnaissance level and the reports are presented only as general approximations of facility characteristics and impacts.

The uncertainty of actual end-use facilities and the inherent problems in defining a "typical facility" limit end-use analysis to broad generalizations. The evaluations are not meant in any way to substitute for detailed site specific evaluations, EISs, or analyses which come later when mining and facility projects are actually proposed. The end-use facility evaluations will not preclude any federal, state, local, or private decisions concerning actual end uses, facility siting, or end-use restrictions. The end-use reports are meant only to provide additional information to be used in decisions concerning the leasing of federal coal in the Fort Union Region and should not prejudice any later decisions.

End-use evaluations, referred to as preliminary facility evaluation reports, have been prepared for those tracts for which a new coal-use facility is expected to be built. One of the three proposed end-use facilities has been assigned to those tracts based on expressions of interest, tract size, or existing facilities. The typical facilities to be considered are: a 250 million standard cubic feet per day gasification plant; a 1,000 megawatt electric power generation plant; and an 85,000 barrel per day indirect coal liquefaction plant.

Part I of the report summarizes what the assigned typical end-use facility might be like. The description of the facility gives plant size, process technology, plant requirements (fuel, land, water, power), emissions, and other characteristics of facilities likely to be proposed in the Fort Union Region. The description includes ancillary facilities and a discussion of construction and operational aspects of the facility that are relevant to determining impacts that could occur in the vicinity of the tract.

The facility description is based on existing analyses, studies, environmental impact statements, and consultation with State and industry representatives. Part II of the facility report is an analysis of the facility impacts on the tract area.

The preliminary facility evaluation reports will be used by the Regional Coal Team to rank federal coal tracts with a better understanding of likely future development impacts and implications.

PART I

ASSUMPTIONS AND VARIABLES

The typical electric power facility characteristics are based on numerous assumptions and reasonable values for important variables. Some of the assumptions and variables are based on best estimates. Others are based on existing literature, facilities, and on input from industry sources.

Facility Location, Type, and Size

Because of the economics of lignite coal, it was assumed in the early stages of the Fort Union coal leasing process that the end-use facilities would be near the tracts to be leased. The energy value of lignite coal as well as the water content make the transporting of lignite for long distances uneconomical. For purposes of issue level impact analysis, the electric power facility assigned to the Garrison tract is not specifically located but assumed to be near the tract. Such an assumption will eliminate the problems of arbitrarily siting facilities. Facilities were sited, however, for the air quality modeling. Where specific site location information was available from potential project developers it was used in the facility analysis.

The proposed electric power facility will produce 1,000 megawatts (gross) of power. The coal-fired electric power plants being constructed or planned in the region generally have from one to three generation units; each producing from 400 to 500 megawatts of power. A facility consisting of two 500 MW units was chosen to be representative of a typical electric power facility.

Construction Period

The construction time span for an electric power facility can vary greatly. A company hiring four to five thousand construction workers could complete the proposed facility in as short a time span as three years. A company could choose to lengthen the construction period or build parts of the plant capacity in two or more construction phases. This would reduce the construction work force and spread construction over as many as ten years.

The assumption is that the facility will be constructed in phases. For the two unit electric power plant, the second unit would begin construction in the third year after the first unit is begun. The total construction period would cover approximately eight years. Work force numbers were supplied by the Basin Electric

Power Cooperative. The average yearly employment figures are based on the projected work force for the Antelope Valley Power Plant.

Water Requirements

Water demands for an electric power facility depend on production technology, plant load factor (percent of output capacity), operation time, and water quality. The values used for water requirements are based on estimates from Basin Electric. The value for gallons per minute is an estimate of average water use for the facility. The yearly requirements are an approximation based on an operation factor assumed for the facility. This operation factor indicates the time the facility will be in operation each year. The electric power facility will assume an average load factor since peak power will not be needed full time due to varying load demand.

For analysis purposes, water for the electric power facility is assumed to come from Lake Sakakawea.

Emissions

The air emissions for the electric power plant will depend primarily on the facility's production process, the amount and quality of coal burned and, the level of pollution control. The electric power facility would use approximately 10 percent of the gross wattage it produces. An assumption affecting air emissions from a generic facility is the quality of the coal. The sulfur, ash, and water content of the lignite will not only influence emissions per ton of coal burned, but will also determine the amount of coal required for a given facility. The air emissions from any type of coal conversion facility will be a function of the conversion process characteristics and the emission control technology used at the facility and the level of control used.

The impacts resulting from air contaminants emitted by the coal end-use facility are deduced by using established air quality standards above which deleterious effects of the contaminants are implied to occur. A facility's ability to meet air quality standards assumes there would be no significant deleterious effects to human health, animals, or vegetation. Such an assumption is the subject of continuing discussion and is disputed by certain research studies. A more detailed discussion of this issue can be found on pages 37-94 in the Final West-Central North Dakota Regional Environmental Impact Study on Energy Development (October 1978). The facilities could also emit certain pollutants for which there are no standards. The anticipated levels of air quality concentrations of contaminants are obtained by measuring existing levels of air quality and adding computer simulation of the atmosphere loading resulting from the end-use facility.

The air quality impacts are considered in terms of ambient air standards and prevention of significant

deterioration standards. Under authority of the Clean Air Act of 1970, the State of North Dakota has promulgated its own ambient air quality standards which are equal to or more stringent than the Federal standards. The purpose of the North Dakota Ambient Air Quality Standards is to control the quality of the air over North Dakota such that, a) the health of sensitive and susceptible segments of the population will not be adversely affected; b) concentrations of pollutants will not cause public nuisance or annoyances; c) significant damage to animals, ornamental plants, forest and agricultural crops will not occur; d) visibility will not be significantly reduced; e) metals or other materials will not be significantly corroded or damaged; f) fabrics will not be soiled, deteriorated, or have their colors affected; and g) natural scenery will not be obscured.

In May of 1977, the North Dakota State Department of Health (NDS DH) received a delegation of responsibility from the Environmental Protection Agency (EPA) for administration of the Prevention of Significant Deterioration (PSD) program and regulations adopted by EPA. The NDS DH had previously adopted PSD regulations, recognizing that the protection of the air quality resource was in the interest of preserving a quality of life and the environment both endowed to North Dakota's citizens.

During 1975, 1976, 1977, and 1978, the NDS DH received applications for and granted air quality permits to new sources in west-central North Dakota. All new sources placed into operation after January 6, 1975, are subject to the provisions of the PSD regulations of EPA and adopted by the NDS DH.

The Clean Air Act Amendments of 1977 designated three levels of allowable deterioration of air quality in regions where air quality was better than the National Ambient Air Quality Standards. All of North Dakota was defined as a Class II area with exception of four smaller areas which were defined as Class I areas. These Class I areas are the Theodore Roosevelt National Park north unit, south unit, and Elkhorn Ranch and the Lostwood National Wildlife Refuge.

The assessment analysis of proposed air quality impacts (deterioration) by proposed new sources is achieved with computer models. These models simulate the physical processes of atmospheric transport, dispersion, chemical transformation, and removal of air contaminants with resulting levels of concentrations of the contaminants. Modeling has been and remains the only tool available to determine air quality impacts of proposed sources or source modifications, since these new sources are not yet producing air contaminant emissions.

The computer modeling assessments of impacts led the NDS DH to declare in 1979 that the increment of allowable Class I area air quality deterioration for sulfur dioxide (SO₂) had been consumed and allocated to the new sources which had been granted construction

permits from 1975. This decision further implied that no additional sources could construct and operate within the geographic corridor bounded by the units of the Theodore Roosevelt National Park and the sources located eastward.

An extensive, detailed discussion of the preceding paragraphs has been published in the Final West-Central North Dakota Regional Environmental Impact Study on Energy Development (October 1978). Copies are available from the NDS DH.

Recently, several applications for permits to construct air pollution sources have been submitted to the North Dakota State Department of Health. According to the applicants' analyses, which utilize more advanced modeling techniques, compliance with all applicable standards was demonstrated.

The NDS DH is currently evaluating these applications as to the appropriateness of the air quality technique. The Department is concurrently establishing its own mesoscale air quality modeling technique in an attempt to standardize the methodology and air quality modeling input data variables. Once this has been accomplished, the actual merits review for each new application can begin.

The limiting case appears to be the question of increment consumption over the Theodore Roosevelt National Park, a Class I area. Ambient Air Quality Standards and PSD Class II increments have not previously prevented the granting of an air quality permit.

At this point in time, no new conclusion regarding the status of the Class I increment has been reached by the NDS DH. If any increment remains, permits would be granted, probably on a first-come first-serve basis, to as many of the applicants as the available increment would allow. Should the Department continue to find that the increment has been consumed, no permits to construct would be granted.

If permits are not granted, the applicants may pursue the variance procedures provided by the Clean Air Act and State Regulations. Applicants may also decide to pursue an offset mechanism which would best suit their individual situation(s).

Given the above existing new source situation, the quantification of air quality impacts resulting from additional facilities associated with certain coal lease tracts is impossible. Discussion of site specific impacts without addressing the interactive and cumulative impacts would have little decision value.

For the purpose of this analysis, each end-use facility which has been assigned to a particular coal lease tract will be discussed. This discussion will contain general statements regarding facility impacts on the air quality. Impact analysis will be based on previous air quality modeling experience and past actions by the NDS DH in permitting similar facilities. Comparisons to applica-

ble standards can be accomplished. For example, when considering these facilities (electrical generating facility or synfuel facility) by themselves, the Ambient Air Quality Standards can be met. Also, the PSD Class II Standards can be met. This is known because these types of facilities have been permitted in the past.

The general statements will be appropriate only within the context of some qualifying conditions. A facility's impact on a given receptor is directly proportional to its distance from that receptor. Generally speaking, the closer a facility is to a receptor, the greater its impact. Therefore, considering the given type and size of facilities, a screening modeling exercise must be undertaken in order to determine the distance a facility must be removed from the park in order to meet the Class I Standard. This distance will be compared to the distance each end-use facility associated with the coal lease tract is from the Class I area.

The approach mentioned above will only demonstrate compliance/noncompliance with the applicable standards without consideration of interaction with other sources. This analysis cannot be substituted for a detailed permit review and care must be taken to use this information with the proper qualifiers and not be taken out of context.

Solid Wastes

Estimates of solid wastes from the facility are based on figures from Basin Electric. Estimates for ash and sludge could vary considerably depending on the ash content of the coal and the pollution control technology used. Planned facilities are proposing to dispose of solid wastes in the nearby mines.

ELECTRIC POWER FACILITY

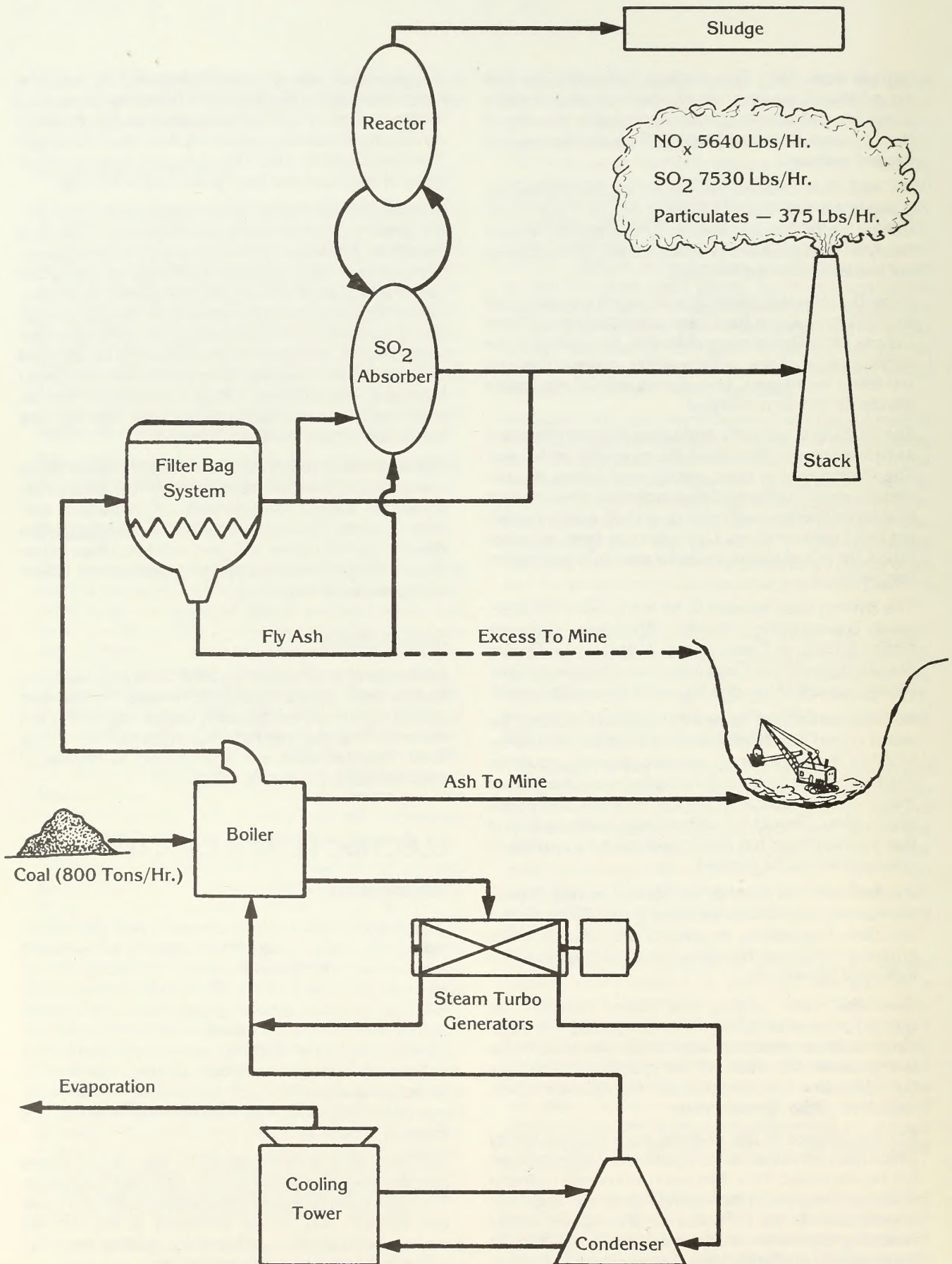
Introduction

A typical coal fired steam electric power generation plant will consist of two 500 megawatt (gross) units located near a lignite coal source. The facility with an average operation factor of .90 and a load factor of .85, will be capable of delivering a maximum of approximately 900 MW to the existing transmission system. The facilities for the electric power complex would consist of the following major areas: 1) coal preparation, 2) power generation, 3) pollution control and waste disposal, and 4) pipeline and transmission facilities. See Figure 1.

The total land area dedicated to the electric power generation facility would be approximately 600 acres. The main building at the facility site will house the boiler and turbine units. Other structures at the site will include facilities for coal handling, cooling water, air pollution control, and administration.

Figure 1

TYPICAL ELECTRIC POWER FACILITY



Employment

The construction of two electric power generation units is expected to last approximately eight years. The average annual number of workers required for plant construction will peak in the third year of construction when substantial work on both units would be underway. The peak construction work force is expected to be approximately 1,900 workers in the second quarter of the third year. Once in operation, the facility will permanently employ about 200 people (See Table 1).

TABLE 1
AVERAGE YEARLY EMPLOYMENT

Year	1	2	3	4
Construction	309	1138	1248	798
Permanent				36

Year	5	6	7	8
Construction	666	580	682	168
Employment	102	108	108	200 etc.

Source: Basin Electric Power Cooperative for Antelope Valley Station.

Coal Preparation, Storage, and Handling

Lignite coal would be transported from a nearby mine to a three-day live storage pile or a sixty-day dead storage pile. From the live storage pile, the coal would be sent by conveyor to be crushed before being transferred to the plant silos for intermediate storage. Finally, coal would be conditioned before being introduced into the furnace for ignition. A typical plant would burn an average of approximately 800 tons of coal per hour or about 5.5 million tons per year. See Figure 2.

Power Generation

In a coal fired electric power plant, the crushed coal is combined with air supplied by forced-draft fans and then ignited and burned in the boiler furnaces. The combustion in the boiler furnace produces heat which creates steam from feed water entering the boiler heat-exchange system. After releasing energy through expansion in the high-pressure section of the turbine, steam is returned to the boiler for reheating. After being reheated, steam is returned to the intermediate section and subsequently to the low-pressure section of the turbine. Spent steam passes through the condenser where waste heat is removed, and the condensed liquid is returned to the boiler feed water system. Combustion gases from the furnace are exhausted to the atmosphere through the pollution control devices. Steam

energy is converted to mechanical energy by the turbine and subsequently transformed into electrical energy by the generator. Generated power is routed through the main transformer for voltage step-up and then to a switchyard and transmission line system for distribution.

Water System

The water for the power plant systems would come from a nearby river or impounded water source. Raw water would be processed to reduce hardness and alkalinity. The treated water would then be stored for use. Demineralization of the filtered water for boiler makeup will be necessary to provide water of the required quality for the steam generation system. There will be several holding ponds included at the facility to store recoverable water.

The power plant will require approximately 13,000 acre-feet of water annually. The plant would use about 9,000 gallons per minute when in operation.

Cooling System

The cooling system for the electric power facility would be mechanical-induced draft wet-type cooling towers. Cooling tower blowdown would be sent to a holding pond to be used for ash sluicing, scrubbers or coal dust suppression.

Emissions and Pollution Control

Burning lignite in the boiler produces gaseous emissions, fly ash, and bottom ash. The gas from the boiler will pass through a fabric filter baghouse and an SO₂ dry scrubber, and will be dispersed by a 600-foot stack (See Table 2).

TABLE 2
AIR EMISSIONS (lbs/hr)

Particulate	Sulfur Dioxide	Nitrogen Oxides
375	7530	5640

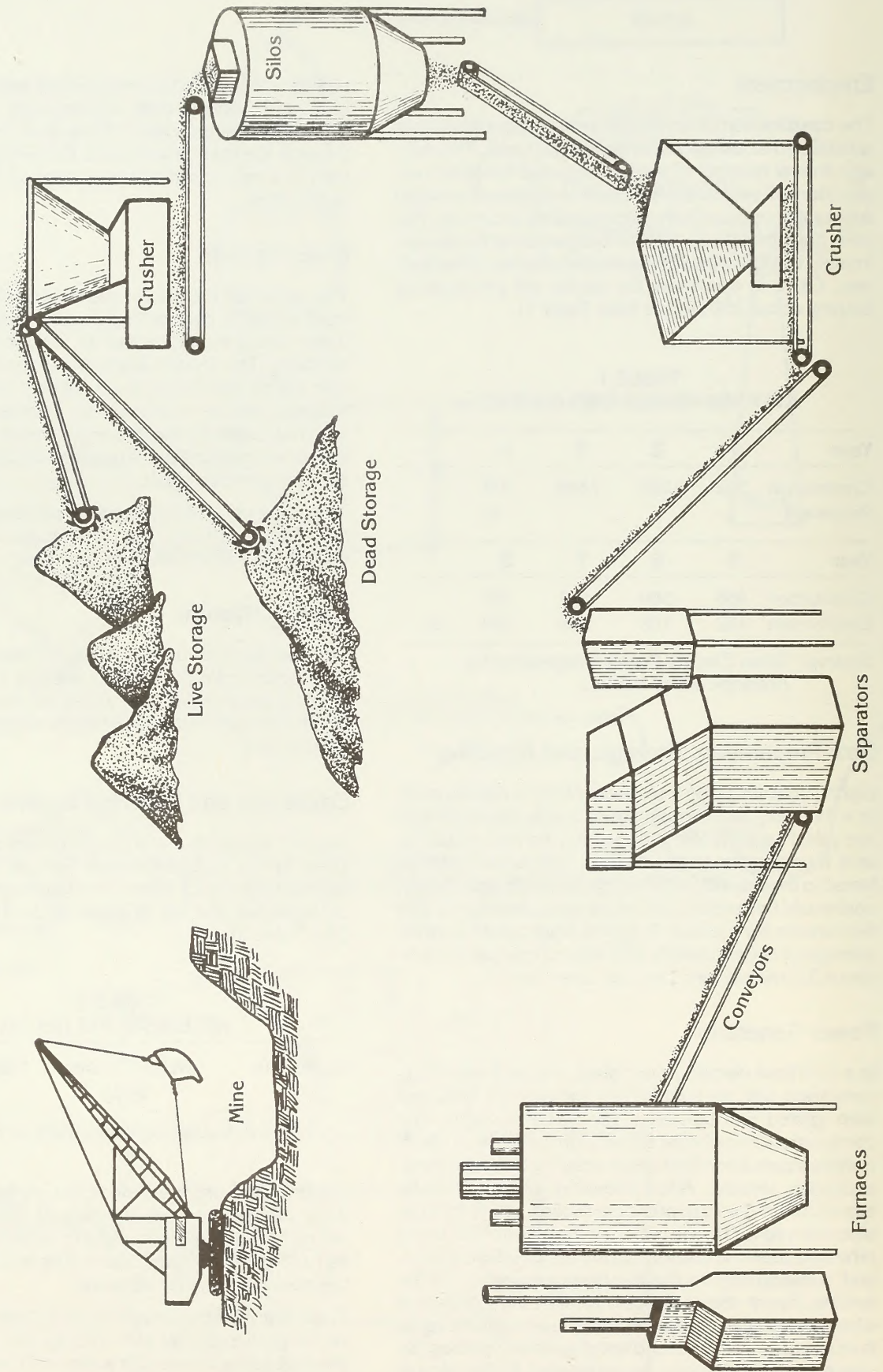
Source: North Dakota Department of Health.

Bottom ash from the main boiler, pyrite rejected from the pulverizer, and ash discharged from the hoppers will be hydraulically conveyed to dewatering bins. The ash will then be loaded into trucks and transported to the adjacent mine for disposal.

The fabric filter baghouse will be installed for the removal of particulate fly ash. The fly ash and scrubber product will be mixed with water and loaded into trucks for disposal in the mine.

Figure 2

COAL HANDLING SYSTEM



The plant will include a dry scrubbing system to absorb SO₂ from the flue gas. The scrubber product will be treated prior to disposal with dry fly ash. The fly-ash/scrubber product would likely be blended with water for dust control and stabilization. Emission of nitrogen oxides will be controlled by designing the boiler for proper mixing and flame quenching. The quantity of wastes would be approximately 80 tons per hour of fly-ash/scrubber product and 10 tons per hour of bottom ash.

Utility and Transportation Corridors

Water will be pumped from the water source to a surge pond. The water pipelines will require a right-of-way consisting of a 100 foot wide construction easement and a 50 foot wide permanent easement. The surge pond would have a water surface area of approximately 42 acres and would contain 1,050 acre-feet of water. Transportation corridors will be required for roads and a railspur. The transmission line leaving an electric power facility would be a 500 KV line with a right-of-way 150 feet wide connecting with an existing system.

PART II

RELATIONSHIP OF TRACT AND FACILITY

The Garrison tract lies three miles northwest of the town of Garrison in McLean County, North Dakota. The tract consists of 16,708 acres of land with recoverable coal reserves of 259.4 million tons.

The likely use of coal mined from the tract would be for an electric power generating plant. To consider the impacts of this coal facility, it is assumed that the typical electric power facility described in Part I would be constructed adjacent to or near the tract with no specific site designated, except for purposes of air quality analysis.

Soils, Vegetation and Agriculture

In the Garrison tract area, the agricultural land consists of approximately 64 percent cropland, 9 percent hayland, and 27 percent rangeland. Based on 1978-1979 county averages determined from ASCS data and from BLM grazing files annual production per acre would average 28 bushels per acre of wheat, 2 tons per acre for hayland, and .5 AUMs per acre for rangeland.

Assuming the same agricultural land use distribution for the 600 acre disturbance estimated for a generic electric power facility, agricultural production foregone on the facility site would be 8,400 bushels of wheat annually, in a worst case situation analysis, for the life of the facility.

A short-term disruption of 12 acres per mile would result during construction of an undetermined length of water pipeline. Roadways would disturb 14.5 acres per mile. A railroad spur, also of undetermined length until final siting of the facility would eliminate agriculture on 18 acres per mile for the entire life of the facility.

Erosion losses due to wind and water from ground disturbed during the construction phase of the facility, given State permitting stipulations, would not be significant. Regionally, the agricultural production lost on the 600 acre facility site also would not be significant. Because of the alkaline soils in the tract area and downwind, no deleterious acid-forming effects to the soil due to acid rains from the facility would be anticipated.

There is evidence documented in the literature (West-Central North Dakota Regional Environmental Impact Study on Energy Development, 1978) that there are potential negative impacts to vegetation and to livestock downwind from such a facility due to nitrogen oxides, sulfur dioxide, and particulate matter. Such negative impacts would be analyzed in detail at such a time as more specific information becomes available in conjunction with facility permit application with the State permitting authority.

Water

Water requirements for an electric power generating facility are approximately 9,000 gallons per minute or 13,000 acre-feet per year. The likely source of water for industrial use is Lake Sakakawea. Withdrawal of water would have no significant impact upon the reservoir. Facility wastes of ash, sludge, and water disposed of in the mine do have the potential to degrade water quality if they are disposed of within the saturated zone which develops upon reclamation. Present regulations require state approval of disposal sites.

Land Use

Changes in land use include displacement of existing use, increased intensity of existing uses, and the introduction of new uses. The site of the facility is likely to displace agricultural use.

The optimum site conditions for facilities are the same as for agriculture; that is, gentle topography and soils with good drainage characteristics. The increase in population of communities results in demand for new housing, additional commercial development, and expanded public use facilities. The area of this development will likely be on off-site agricultural land. The on-site displacement of agricultural land use is discussed in the Agriculture section of this report.

Increased population would create a demand for community services as addressed in the Social and Economic Conditions section of this report. This

demand implies a need to expand existing facilities and commercial establishments or to create new ones. Existing commercial establishments may suffer through the construction of new facilities outside the downtown areas. Public services would be stretched in the short term by lack of capital to implement change due to increased population. Parking shortages, traffic congestion, and excessive wear and tear on roadways would make downtown areas less habitable. Municipal organizational structures and physical space may prove inadequate with increased population. For example: a part time mayor may be overworked, processing of permits may delay private building construction, and filing space for public records may prove inadequate.

With the influx of workers and their families, a change in the composition of the community is inevitable and demands for new forms of public and commercial facilities for shopping, recreation, and entertainment would ensue. These types of changes are likely to result in dissatisfaction by both the existing resident population and the newcomers. Conflicts are likely to occur as a result of the contrast in the lifestyles of these populations.

Existing planning varies considerably from community to community. Some are prepared for change presaged by recent oil and gas development in some areas, while others are ill prepared for the change in population anticipated.

Current perception of county residents with regard to roads, retail opportunities, recreational/entertainment facilities, and housing are discussed in detail in Chapter 2 of the Site Specific Analysis for Economic and Social Conditions.

Similarly, forecasts by city/county planners regarding likely changes in community services resulting from facility related population growth are presented in detail in the Economic and Social Conditions section of this report.

Recreation

Recreation in the tract vicinity is limited to dispersed big game hunting. Although there are some facilities in the tract vicinity, those existing regional recreation facilities (community camping and picnic areas, Theodore Roosevelt National Memorial Park, and Lake Sakakawea) are expected to receive the majority of recreation demand. The regional EIS will address in more detail the expected regional demand from increased population for recreation.

Wildlife/Fisheries

Impacts of an electric power facility on wildlife in the Garrison tract area could occur in two areas: 1) impacts from destruction of habitat and 2) direct and

indirect impacts from the increase in human population.

The removal of vegetation for a 600 acre electric power facility and the expansion of urban areas, highways, and railroads would prevent or reduce the use of an area by wildlife regardless of the type of vegetation removed. Much of the area around the tract contains native prairie, wetlands, and some shrublands essential to many species. Careful siting of the facility would limit the destruction of these areas.

If powerlines, pipelines, access and haul roads are constructed in key wildlife areas, partial or total destruction of habitat would occur depending on the magnitude of development. The worst case would destroy present wildlife populations in the area. Wildlife oriented recreation such as hunting and wildlife observation would have to be sought elsewhere. Wildlife would be impacted by eagle electrocutions on powerlines, migratory bird mortality from striking powerlines close to wetlands, road kills along transportation routes through important wildlife areas, harassment of wildlife by off-road vehicle use, increased poaching, and habitat destruction.

Poaching and road kills have increased dramatically in areas of North Dakota, Montana, Wyoming, and Colorado where energy development has occurred. The problem is compounded in areas where transportation corridors are located in important wildlife areas and shift changes coincide with wildlife feeding periods. This situation could occur in the Garrison tract area.

The impact to wildlife could be mitigated by: 1) siting the electric power plant and associated facilities with regard for essential wildlife areas, 2) adjusting work shifts to avoid feeding times of highly visible wildlife, 3) mass transportation of employees, 4) providing funds to State fish and game agencies to better control illegal shooting of wildlife, and 5) adopting a poaching clause in union contracts.

Taking water from shallow bays in Lake Sakakawea could have significant adverse impacts. These areas are prime nursery and spawning areas for sport, commercial, and forage fish. Taking water from deeper noncritical areas of the reservoir could reduce or eliminate the significant impacts to fisheries. The cumulative increases in industrial, urban, and other water uses will dictate the severity of the impacts on fisheries. The cumulative impact will be addressed in the regional EIS to be prepared.

Cultural Resources

The Garrison tract area has not been inventoried to date. Information from existing inventories (BLM unpublished data, Davis 1976; Greiser 1980) outside the Fort Union coal region suggests that the predominant prehistoric sites should be lithic scatters of varying size, density and function (ca. 70-80%). Other expected

prehistoric resources include stone circles (ca. 10%-20%), ceramic-bearing sites, rockshelters and kill sites (ca. 10% combined). Expected historic resources include homestead and ranching remains (ca. 50%), historic graffiti and rock art (ca. 20%), freight roads, dugouts, cairns, trading posts, burials and battle sites (ca. 30% combined). Further information on cultural resource occurrence, distribution and significance cannot be quantified prior to inventory.

Visual Impacts

Central North Dakota has very high but common visual quality. In the absence of other types of visual experiences, the landscape is not highly valued as scenery because of the vast distances involved in crossing this relatively uniform area. Most highways roll with the landform so views alternate between nearby features at low points and panoramas of up to thirty miles at high points in the roadway profile. The landscape is seen in terms of these short vistas of landscape elements that will not be seen again, and short duration views of distant landscapes in which any vertical object or landscape feature serves as a focal point.

Large structural features in the central North Dakota landscape contrast with the landscape both in terms of the visual surface (the character of what is seen) and in terms of function. Vertical and linear components of a facility, because of hard architectural edges of the structures, and the transitory nature of panoramic views imply a visual importance of these large objects for orientation. The aesthetic response is secondary to this visual function.

Neglecting cultural bias, the aesthetic response to stark architectural lines and pure planes of color contrasting with the simple curvilinear landforms of the countryside can be considered positive. This visual experience would be immediately comprehensible and would provide relief from a relatively uniform countryside. Beyond this initial response, however, are responses with origins in cultural bias and the individuals' relationships to the land. The greatest effect would be upon local residents with memories of the existing landscape to use as a comparative basis of judgment. If no attachment to the existing landscape is present, the facility would be judged more on its quality than on cultural bias.

The visual impact would be the penetration of the skyline by the facility in views from communities and major transportation corridors. The 600-foot stack could potentially be seen thirty or more miles away. Powerlines originating at the site would have more extensive consequences. Consideration for corridor planning related to the placement of facilities is essential to maintain visual quality in the region. The facility would be highly visible and would demand a response either positive or negative. The dominance of the facility in the

landscape could be perceived as a loss of amenity through impairment of the landscape as it now exists for the forty years of the facility's expected life.

Economic and Social Conditions

Construction and operation of the Garrison facility would result in impacts upon services in some communities within the area as a result of population growth associated with employment opportunities. Figure 3 shows forecasted community employment and population levels through the year 2000 both with and without development of the facility. As these figures show, Garrison and Washburn, North Dakota would experience increases in both population and employment as a result of development of the facility.

FIGURE 3

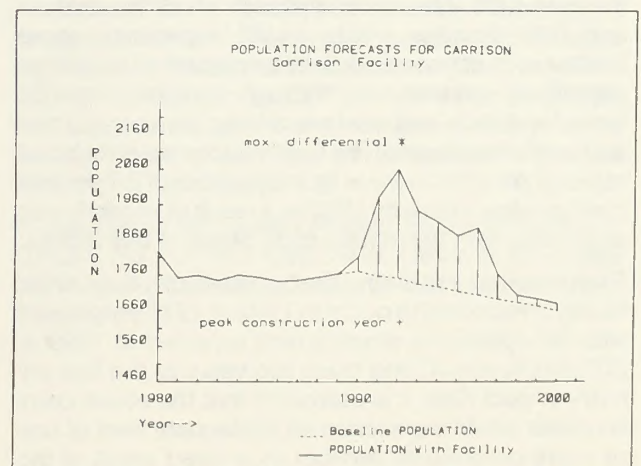
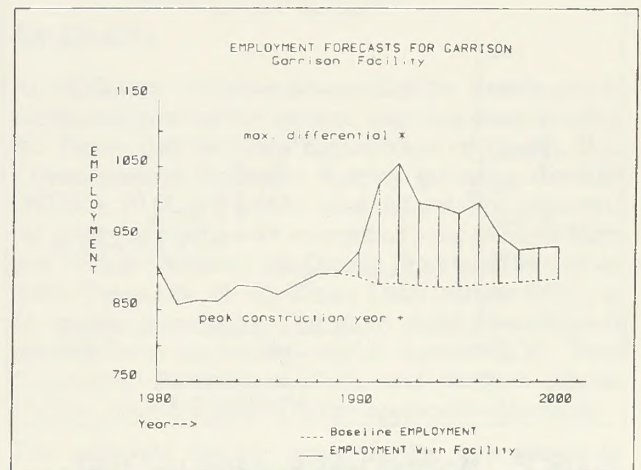
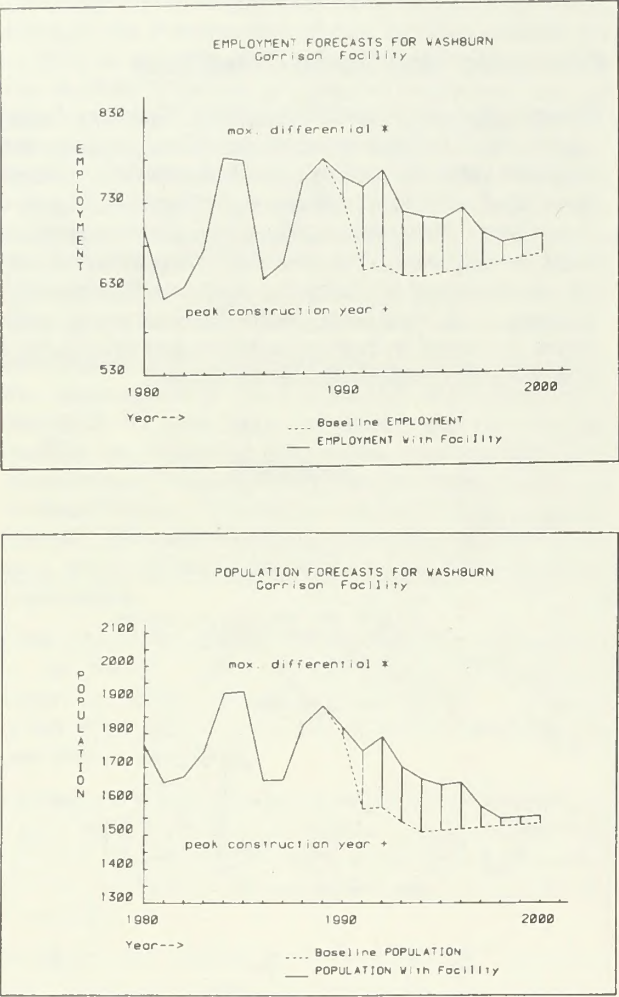


FIGURE 3 (continued)



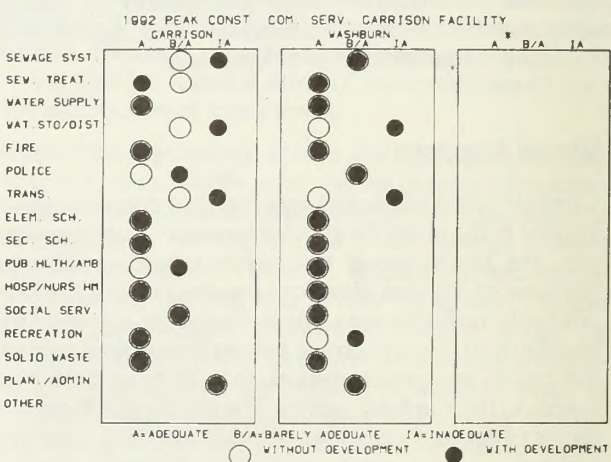
SOURCE: Mountain West Research, Inc., 1981.

Changes in regional personal income from facility development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditures and through company expenditures for goods and services during the construction and operation phases. The facility is forecasted to boost regional personal income by a maximum of 2.7 percent over baseline values by 1992 as a result of expenditures associated with the construction phase of this facility.

Peak employment during the construction phase of the facility is expected to occur in 1992 at 1248 employees with full operations employment expected in 1999 at 200 employees. Using these two years as the first primary impact date, it is estimated that the above communities would experience an inadequate level of one or more community services as a direct result of the

1992 peak construction employment/population levels associated with construction of the facility (Figure 4).

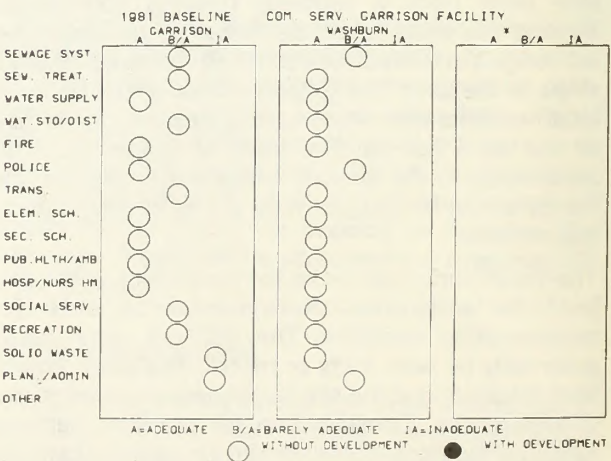
FIGURE 4



SOURCE: Respective city/county or regional planners

Population associated with full operation (i.e., 1999 and beyond) of the facility is not expected to cause services in any of the communities to be thrown into an inadequate situation as a result of facility development. However, Garrison would experience inadequacy of its planning and administration services by 1999 even without facility development. For comparison purposes, Figure 5 shows current (1981) community service assessments for impacted communities.

FIGURE 5



SOURCE: Respective city/county or regional planners

The adequacy ratings appearing in Figures 4, and 5 reflect assessments by either city-county or regional planners for the communities involved and constitute the planners' best judgments concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1992.

The social effects of the Garrison facility's construction and operation would fall in McLean and Burleigh-Morton counties. Available information, acquired through BLM interviews from McLean County, indicates that about two-thirds of the twenty-five persons interviewed support the construction and operation of a coal conversion facility or facilities in the area. Since there are already power plants sited locally, this evidence, though weak, appears to reveal that residents are not particularly concerned about them at this point in time.

Support for another facility or facilities among officials in McLean County was very high. Leaders were unanimous in their endorsement of such proposals.

In terms of absolute population effects, the Bismarck-Mandan area would receive the bulk of effects should the facility be constructed. However, in Bismarck and Mandan, the effect is projected to be only two percent above baseline population levels during peak construction and relatively lower during operations. In McLean County, however, the communities of Garrison, Underwood, and Washburn would have population changes during peak construction of ten to twenty percent above baseline. In these communities, some residents, due to past industrial job experiences, potential for acquiring industrial skills, and opportunity to take advantage of increased economic activity, would financially benefit from such a facility. Others in the area would be less capable or less interested in taking advantage of such activity. These persons, during the short-term construction phase, would face a slightly altered community atmosphere due to the Garrison facility. These changes would be short term. As the operational phase would begin, the population effects and subsequent social effects of the Garrison facility would fall almost unnoticeably on Bismarck and Mandan. son facility would fall almost unnoticeably on Bismarck and Mandan.

Information from McLean County residents reveals that the natural environment, along with the social environment of the area is widely appreciated by many residents. The social consequences of construction and operation of the Garrison facility would occur in McLean County almost entirely during the construction phase. Growth levels of this magnitude are not

expected to affect resident satisfaction with their community to any noticeable extent, except perhaps during peak construction.

Burleigh, Morton, and McLean counties are in a positive position to absorb the population effects of the Garrison facility. Bismarck and Mandan are quite large and diversified. The population effects of the facility, both during the short term and the long term, would not have significant effects on these respective cities. In McLean County, the population effects are limited, particularly during the short term. In addition, there has been some administrative experience with industrialization and McLean County is fairly diverse economically as compared to other counties (for example, Dunn in West Central North Dakota). Therefore, it is not expected, during either the short term or the long term, that the Garrison facility would have profound effects on the social life of the affected communities. The institutional (religious, leisure, occupational, and political) makeup of these areas would not be affected to any great extent by construction of the Garrison plant.

Air Quality

An Air Quality Modeling Analysis¹ of the electric power facility assigned to the Garrison tract was conducted by the North Dakota State Department of Health. U.S. Environmental Protection Agency guideline models² (MTPER, PTPLU, PTMAX) were utilized. The projected air quality impacts were compared to applicable State and Federal Ambient Air Quality Standards as well as State Prevention of Significant Deterioration (PSD) of air quality increments. The three major air pollutants emitted from the facility—sulfur dioxide (SO₂), Total Suspended Particulates (TSP), and nitrogen dioxide (NO₂)—were compared to the applicable standards.

The assigned electric power facility was shown to comply with all State and Federal Ambient Air Quality Standards. It was also found to be in compliance with all State PSD increments.

¹Guidelines for Air Quality Maintenance Planning and Analysis Volume 10 (Revised): Procedures for Evaluating Air Quality Impact of New Stationary Sources, EPA-450/4-77-001, October 1977, (OAQPS No. 1.2-029 R), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

²Guideline on Air Quality Models, EPA-450/2-78-027, OAQPS No. 1.2-080, April, 1978, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

LIST OF SOURCES FOR THE PRELIMINARY FACILITY EVALUATION REPORTS

ITAT Construction Work Force Report for February 1981; Inter-Industry Technical Assistance Team, Basin Electric Power Cooperative, Bismarck, North Dakota.

Basin Electric Power Cooperative; 1717 East Interstate Avenue, Bismarck, North Dakota 59501.

The Nokota Company; Suite 112, Provident Life Building, Bismarck, North Dakota 58501.

The American Natural Resources Company, 1 Woodward Avenue, Detroit, Michigan 48226.

Final Environmental Impact Statement for the Great Plains Gasification Project, Mercer County, North Dakota. Prepared by the U.S. Department of Energy. August 1980.

Environmental Assessment of a Coal Gasification Complex in Dunn County, North Dakota. Prepared by the Natural Gas Pipeline Company of America.

Identification of Synthetic Fuel Impacts: A Preliminary Assessment. Prepared for the Montana Department of Natural Resources and Conservation by teams at the University of Montana and Montana State University. August 1980.

Montana Energy Almanac. Prepared by the Montana Department of Natural Resources and Conservation. October 1980.

West-Central North Dakota Regional Environmental Impact Study on Energy Development. Prepared by the U.S. Department of the Interior, Bureau of Land Management and the State of North Dakota. October 1978.

North Dakota State Department of Health; Bismarck, North Dakota.

Montana Department of Natural Resources and Conservation; Helena, Montana.

The Tenneco Coal Gasification Company; P.O. Box 491, Glendive, Montana 59330.

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

R'S CARD

G366 1981

coal region,
tract analysis

DATE
RETURNED

OFFICE

(Continued on reverse)

TD 195 .C58 G366 1981

Fort Union coal region,
Garrison tract analysis

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

